

Original Article**Transcutaneous electrical nerve stimulation in female stress urinary incontinence***Zahra Shahshahan*, Marjan Labbaf*****Abstract**

BACKGROUND: Stress urinary incontinence (SUI) is a prevalent medical problem for women especially through escalation of age. Many conservative nonsurgical therapies have been used for management of this problem which will usually be followed by high relapse rates or frequent side effects. Evaluation of the efficacy of transcutaneous electrical nerve stimulation (TENS) in management of genuine SUI has been studied in a few trials. We sought to assess the effectiveness and complications of high frequency TENS in SUI.

METHODS: In a clinical trial, 10 sessions of high frequency TENS with 15 minutes duration every other day were applied for 40 women with genuine SUI. Treatment results were evaluated by SUI severity index at the end of first and sixth months after final session of TENS and they were compared with the baseline index.

RESULTS: Seven patients (17.5%) were omitted from the study because of intolerance of TENS. In the remaining 33 patients, there was no sign of any complication. In comparison to baseline, severities of SUI showed significant decrements at first and second post-intervention evaluations ($P < 0.0001$). There was a significant increase in SUI index from first month to sixth month ($P < 0.0001$).

CONCLUSIONS: TENS is a safe and cost-effective method for SUI management but its effectiveness decreases by time.

KEY WORDS: Transcutaneous electrical nerve stimulation, stress urinary incontinence.

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Urinary incontinence has been defined as a condition in which involuntary loss of urine results in social, hygienic, or religious problems (especially for Muslims). Urinary incontinence can be divided into extraurethral or transurethral categories based on route of urine loss¹. The most common form of transurethral urinary incontinence is genuine stress incontinence that is considered when urine loss occurs during periods of increased intraabdominal pressure^{2,3}. A community survey of 1060 randomly selected women more than 18 years of age in South Wales found that 22% of women had this complaint⁴. Nygaard reported 27% prevalence rate for SUI (stress

urinary incontinence) in collegiate female varsity athletes⁵. Although SUI is not a normal part of aging, it often becomes a clinical problem for the aging women as the trauma of childbirth and the loss of estrogenic stimulation at menopause weaken pelvic support and diminish the amount of normal homeostatic reserve available to cope with stresses placed on bladder⁶. Usually, treatment of SUI begins with conservative nonsurgical managements of physical therapy and/or selected pharmacologic agents such as pseudoephedrine, phenylpropanolamine or imipramine^{7,8}. Unfortunately, during the first 6 months most of

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Passage of an electrical current through the muscles of pelvic floor causes muscle contraction and simultaneously induces a reflex inhibition of detrusor activity^{9,10}. Usually, the stimulus is applied transvaginally or transrectally in either continuous or intermittent fashion^{11,12}. This mode of therapy has been widely used for urge incontinence (which results from detrusor instability or overactive bladder) and many authors have reported good success rates⁹⁻¹². Our survey of literature showed that the utility of surface high-frequency transcutaneous electrical nerve stimulation (TENS) to promote strengthening of the muscles of pelvic floor which can lead to improvement of genuine SUI has been rarely evaluated and the reported results are controversial^{13,14}. Therefore, we attempted to evaluate the response rate of nonperineal TENS in adult females with genuine stress urinary incontinence.

Methods

The protocol of this study was approved by the Department of Obstetrics and Gynecology and Research Committee of the Faculty of Medicine, Isfahan University of Medical Sciences. After complete description of the study to eligible subjects, written informed consent was obtained.

All consecutive adult women referred to Shahid Beheshti Hospital (affiliated to Isfahan University of Medical Sciences) with subjective complaint of severe urinary incontinence between March 2002 and November 2002 were included in this before-after clinical trial. Subjects had a diagnosis of transurethral urinary incontinence as mentioned by the referral gynecologist. To confirm the diagnosis of genuine SUI, the patients were examined by the second author with Q-tip test^{15,16} and Bonney test¹⁷. The exclusion criteria were co-existing extraurethral urinary incontinence, use of drugs which could affect SUI, presence of scar in the field of electrode placement, and patient intolerance of TENS.

Technique

Each patient was provided with a high-frequency transcutaneous electrical nerve

stimulation (TENS), Interferential 520, to affect levator ani muscles. A machine was preset at automatic function of 5:1:5 tunes (5 seconds at 100 Hz, 1 second for modulation, and 5 seconds at 150 Hz). The depth of modulation was 100% to reduce the need for exact electrode placement^{18,19}. Two of the electrodes were placed bilaterally on ischial tuberosities and the other two electrodes were applied on the either side of the midline of the suprapubic area¹⁸. All patients had to have 10 sessions 15 minutes in duration every other day. Disposable adhesive surface electrodes were used for each patient.

Clinical Evaluations

Prior to initiation of TENS, all patients were evaluated by self report voiding/incontinence diaries for the preceding week. Patients were considered in grade I of SUI severity index as more than 90% of episodes of urinary incontinence occurred with strong rise in intraabdominal pressure (sneezing or coughing). In grade II of SUI severity index, more than 90% of incontinence episodes happened when patients performed hard exercise (going upstairs up rapidly). Grade III of SUI severity index was defined as more than 90% of urinary incontinence occurring by standing up 20. The patients' reports of the SUI severity index were also evaluated one and sixth months after the final TENS session.

Statistical Analysis

Statistical analysis was carried out using SPSS 11.5 for windows (SPSS Inc., Chicago, Illinois, USA). Wilcoxon Rank test was used to compare the changes of the SUI severity index from baseline to first and second post-intervention assessments. All statistical tests were two-tailed with a significance level of 0.05.

Results

Of the total 64 eligible patients completing the protocol requirements, 24 did not agree to be included in this study. Seven patients (17.5%) were excluded because of intolerance of TENS (i.e. they did not like it and failed to refer for

follow up). The patients were aged between 29 and 73 years with mean age (SD) of 46.91 (9.75) years. The patients had 1 to 10 parities with mean (SD) of 4.94 (2.05). Average number of normal vaginal delivery and cesarean section in these patients were 4.64 (2.32) and 0.3 (0.08), respectively. The average duration of time since last delivery was 15.97 years.

The results of assessing SUI severity index at baseline, first and second evaluation are

shown in table 1. Wilcoxon test revealed a statistically significant decrease of the severity of SUI from baseline to first month assessments ($P < 0.0001$). Comparison of SUI severity at baseline and sixth month also showed a significant difference ($P < 0.0001$). On the contrary, there was a significant increase in SUI index from the first month to the sixth month ($P < 0.0001$). There were no signs of any complications throughout the study.

Table 1. SUI severity index at baseline, first and second assessments (N = 33).

Grade of SUI	Baseline	First month	Sixth month
Zero	0 (0%)	23 (69.7%)	13 (39.4%)
I	12 (36.3%)	10 (30.3%)	19 (57.6%)
II	20 (60.6%)	0 (0%)	1 (3%)
III	1 (3%)	0 (0%)	0 (0%)

Table 2. Presence of SUI according to cotton swab test.

	Pretest	First month	Sixth month
Presence	33 (100%)	3 (9.1%)	13 (39.4%)
Absence	0 (0%)	30 (90.9%)	20 (60.6%)

Table 3. Presence of SUI according to stress test.

	Pretest	First month	Sixth month
Presence	33 (100%)	3 (9.1%)	14 (42.4%)
Absence	0 (0%)	30 (90.9%)	19 (57.6%)

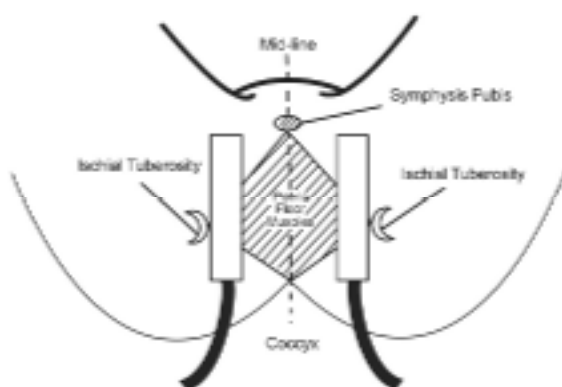


Figure 1. TENS Technique.

Discussion

Many different methods have been used for stress urinary incontinence and finding an effective, available and non-invasive method can help many patients. Using surgical methods can solve this problem in 30-65% of cases²¹.

This study revealed that patients given high frequency transcutaneous electrical nerve stimulation had less genuine stress urinary incontinence at the end of first month after the final session of TENS. Although this improvement continued for the 6 next months, but its effectiveness decreased in follow up assessments. Several studies had revealed the same results for evaluation of TENS effectiveness in urge incontinence⁹⁻¹² but few controversial results reported for genuine stress urinary incontinence^{13,14}. Based on low complication rate and suitable economic cost-benefit ratio, the low long-term success rate can be overcome by repeated booster sessions.

However, there were some obvious limitations in our work. This study was a before-after clinical trial and could be followed by blind randomized clinical trials with parallel groups and larger sample sizes. We evaluated the response rates of patients only by one sub-

jective assessment method; no objective and more sensitive tools such as urodynamic methods was used. We used a fixed-dose protocol of TENS application but it might be necessary to adjust the stimulation parameters to maintain an optimal response.

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