Transvaginal Electrical Stimulation in Female Genuine Stress Incontinence

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Abstract. Objective: In this study the efficacy of transvaginal electrical stimulation in female genuine stress incontinence was assessed. Methods: Female patients with urinary incontinence were examined physically following history in a multiclinically based study involving Urology, Gynaecology, Physical Therapy and Rehabilitation. Urodynamics were performed for all patients, and 27 patients with genuine stress incontinence were included in this study. Transvaginal electrical stimulation were applied to the patients 30 mins once a day, 5 days a week, for a total of 4 weeks. The daily number of pads, incontinence and micturition times (day-night) were obtained and all patients completed the incontinence-specific quality of life questionnaire (I-QoL) before, at the end of and at the 3rd month after therapy, and 25 patients who completed this study were evaluated. Results: In patients treated with transvaginal electrical stimulation, the times of incontinence, micturition times, and number of pads were significantly decreased ($p<0.001$) and the scores of I-QoL were significantly increased ($p<0.001$) after treatment and at the 3rd month post-treatment when compared with pretreatment levels. According to subjective assessment eighteen (72%) of patients were cured. The number of patients improved moderately and minimally were 4 (16%) and 3 (12%) respectively. No patient reported side effects during treatment. Conclusion: Transvaginal electrical stimulation could be an effective and safe treatment for women with genuine stress incontinence.

Key words: Genuine stress incontinence, Electrical stimulation, Quality of life.

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INTRODUCTION

Urinary incontinence is involuntary loss of urine and can be measured objectively. It causes social and hygienic problems and it is a relatively common disorder among women¹⁾. The most common type of urinary incontinence is the stress type. It happens when intravesical pressure exceeds urethral closure pressure as a result of physical activities which increase intraabdominal pressure. The etiologic factors are injury of perineal nerves and weakness of the pelvic floor muscles which are generally seen after obstetric or surgical injuries^{2, 3)}.

Even though genuine stress incontinence is often

treated surgically, the use of rehabilitation methods are increasing in use. Pelvic floor exercises, biofeedback and pelvic floor muscle are some of the conservative methods advised for adult urinary stress incontinence before invasive procedures^{4, 5)}. It has been reported that electrical stimulation may be an effective alternative method to surgical treatment with success rates of 6–90% in the treatment of genuine stress incontinence, but it has not been widely used because of a lack of knowledge about its physiology and technical principles^{5–7)}. There are some different reports about the daily treatment numbers, and the application time of the device⁴⁾.

The aim of this study was to assess the efficacy of transvaginal electrical stimulation in genuine stress incontinence.

PATIENTS AND METHODS

In this study women with urinary incontinence were evaluated in urology, gynaecology, physical therapy and rehabilitation clinics and all patients underwent Q tip tests, stress tests, speculum examination, urodynamics following history and physical examination. Twenty seven women with genuine stress incontinence were included this study. Women with atrophic vaginitis, vaginitis, uterin or rectal prolapsus, cystosel, diabetes mellitus, heart pace maker, neurologic deficits, renal or hepatic dysfunction and suspected pregnancy were excluded from the study. It was obligatory for all women to have normal urine microscopy, negative urine culture and stable bladder normal capacity in urodynamics.

Transvaginal electrical stimulation (TVES) was applied to all patients 30 min once a day, five days a week, for a total of four weeks. We used a portable electrical pulse generator with a vaginal probe (trio 300 manufactured by ITO company). The application frequency was 50 Hz, the pulse width 150 μ s, work/rest time was 5/10 seconds and the stimulation intensity applied to the patients was the maximum level of current that patients could tolerate.

The daily micturition times, number of nocturia, daily incontinence times, daily used pad numbers were all recorded before, following and at the third month after treatment. In addition to these the incontinence-specific quality of life questionnaire (I-QoL)⁸ forms were filled in by all patients. This form included 22 questions, all answers were scored as follows: not at all (5), a little (4), moderately (3), quite a bit (2), extremely (1).

Paired Student's t test was used for statistical evaluation. The women free of incontinence and stopped pad usage were accepted as cured. A fifty percent reduction in incontinence and pad numbers was accepted as moderately improved, and a less than fifty percent reduction was accepted as minimally improved.

RESULTS

Twenty five of 27 patients completed the

Table 1. Urodynamic data of patients before treatment

Urodynamic measures	
First sensation (ml)	200 $\pm$ 21.03
Residual urine (ml)	0
Maximum capacity (ml)	349.41 $\pm$ 24.83
Maximum flow rate (ml/s)	31.6 $\pm$ 6.41
Mean flow rate (ml/s)	12.7 $\pm$ 3.43

treatment. All were in premenopausal period with average age 33.2 $\pm$ 3.01 years, with 5.3 $\pm$ 2.8 deliveries and with incontinence history of 5.88 $\pm$ 1.26 years. All patients were multipars with vaginal delivery and none had a history of surgery, or radiotherapy.

The daily incontinence times which were 6.2 $\pm$ 3.1 before treatment were decreased to 1.14 $\pm$ 0.25 following treatment, and to 1.17 $\pm$ 0.84 after the third month; this was statistically significant ($p < 0.001$). The number of pads were 3.02 $\pm$ 1.64, 0.5 $\pm$ 0.15 and 0.5 $\pm$ 0.14 before, following and at the third month after treatment, respectively. The numbers before and after treatment were statistically significant ($p < 0.001$). The frequency was 7.4 $\pm$ 2.61, 5.1 $\pm$ 1.51 and 5.03 $\pm$ 1.61 before, following and at the third month after treatment, respectively. Also, nocturia was 2.1 $\pm$ 0.54, 1.05 $\pm$ 0.01 and 1.04 $\pm$ 0.01 before, following and at the third month after treatment, respectively. The results of daily micturition times and nocturia were statistically significant after treatment ($p < 0.001$).

The mean score of I-QoL of 25 patients was 61 $\pm$ 12.4 before treatment. The score was 88 $\pm$ 7.31 after the treatment and 88 $\pm$ 6.34 at the 3rd month after treatment. All these post-treatment scores were statistically significant when compared with pre-treatment scores ($p < 0.01$).

DISCUSSION

The most frequent treatment for genuine stress incontinence has been surgery up till recently. As it is an invasive treatment and has complications like bleeding, pelvic pain and difficulties of micturition, the patients and physicians tend toward conservative treatment modalities⁹. Drugs, hormonal replacement therapy, mechanical support devices, rehabilitation of pelvic floor and electrical stimulation are some of the treatment alternatives to surgery¹⁰. Even though the cure rates of surgery in

Table 2. The daily number of incontinence, pad, micturition and the mean scores of I-QoL of the patients before and after the treatment

	Before treatment	After treatment	3rd month
Number of incontinence/day	6.2 ± 3.1	1.14 ± 1.04*	1.06 ± 1.01*
Number of pad/day	3.02 ± 1.64	0.5 ± 0.1*	0.5 ± 0.2*
Number of micturition/day	7.4 ± 2.61	5.1 ± 1.51*	5.03 ± 1.61*
Number of micturition/night	2.1 ± 0.54	1.05 ± 0.01*	1.04 ± 0.01*
I-QoL	61 ± 12.4	88 ± 7.31*	88 ± 6.84*

*p<0.001 compared with before treatment.

genuine stress incontinence was reported as 70–90%, according to the results of a questionnaire, only 14% of patients prefer surgical treatment^{7, 11}. The first step of conservative treatment is pelvic floor exercises to strengthen pelvic floor muscles. Recurrent voluntary contractions can be seen after optimal application of Kegel exercises⁷. But its cure rate was reported as 12–13% and the number patients refusing to continue treatment is quiet high^{9, 11}. Biofeedback is a method which increases the success of Kegel exercises by making the patients sense the contractions using audio or visual devices¹². When Kegel exercises were performed using biofeedback, the decrease in incontinence is 61%¹³.

Electrical stimulation is the application of faradic and interferential current. Faradic current has a low frequency whilst interferential current has a medium frequency. Faradic current is dismissed because of its painful application. Electrodes or vaginal probes are necessary for interferential therapy application^{14–17}. It has been reported as being more efficacious in urinary incontinence than Kegel exercises¹⁸.

Muscle strength and contraction increase with electric stimulation of the pelvic floor muscles. Also urethral pressure increases with direct stimulation of the pudendal nerves. The reflex stimulation of pelvic nerves inhibits detrusor, regulates local blood flow, increases cognitive function and increases adrenergic activity while decreasing cholinergic activity^{1, 17, 19–21}. Delay in the reaction of pelvic floor reflexes and/or weakness of the pelvic floor muscles can cause stress incontinence so the electrical stimulation of the pelvic floor may restore the neuromuscular activity⁵. Since the current spreads, more motor units can be affected and a stronger contraction can be obtained⁵. Even though it was reported that

TVES was an ineffective method, different uncontrolled studies using intravaginal stimulation reported 80% success rates recently^{17, 18, 22}. Electric stimulation for TVES has been practiced for 25 years, however, this is no consensus about optimum treatment parameters⁴. Electric stimulation devices and treatment protocols for TVES are different. It is not possible to decide the exact time of stimulation, the work/rest time, total treatment time and frequency¹⁸. The most efficacious modality on urethral closure pressure is with a frequency of 20–50 Hz, and a pulse time of 1–5 ms⁷. It has been reported that high frequency stimulation delays fatigue more than low frequencies during electrically stimulated contractions²³. Therefore, in our study we decided it would be more efficient to apply a stimulation frequency of 50 Hz with a 150 µs pulse width. The stimulation intensity was modulated by patients tolerance.

In our study 72% of women were cured and 16% reported more than a 50% improvement. In the study of Bent et al.¹⁷ where the electrical stimulation was applied twice in a day for six weeks, the success rate was 71%. Eriksen and Eik-Nes⁵ studied 55 women with stress incontinence and applied treatment for 5 months and reported a 68% success rate. Montgomery and Shepherd¹⁰ combined electric stimulation with pelvic floor exercises for 2–8 weeks and after two years follow up they reported a 91% success rate. The main factors for this high rate was attributed to proper selection of cases, conviction and ability of the instructor, and patient motivation. We thought that the characteristics of our patients, such as relative young and premenopausal multipars with short history of incontinence and without history of surgery and radiation, were important in obtaining the success rate of 72%.

In another study, intravaginal electrical

stimulation was applied to 9 patients for four weeks. Four patients were accepted as cured, because they were free of incontinence and pads, and 66% of patients reported more than 50% recovery¹⁸⁾. The average age in that study was higher than in ours and 33% of women were postmenopausal. In the study of Smith¹⁸⁾ the current was initiated at 5–10 mA and increased till 80 mA. We applied the maximum current amplitude that the patient could tolerate and the application was performed in hospital. The optimum treatment parameters are still not considered but it is well known that different types of application effect the treatment outcome⁴⁾. It is also well known that it is best to apply the treatment in hospital and that modifying the treatment according to patients characteristics, increases the treatment outcomes^{24, 25)}. In this study 72% of patients urinary incontinence disappeared, in 16% decreased more than 50% and in all patients average daily incontinence times decreased following and at the 3rd month after treatment. The best measure of treatment outcome is the decrease or disappearance of urinary incontinence times^{26, 27)}.

As the reflex stimulation of pelvic nerves inhibits the detrusor and as the patients incontinence anxiety decreases or disappears after the treatment, patients daily micturition and nocturia decreases.

The physical, social and sexual disadvantages of incontinence have been well demonstrated in previous studies²⁸⁾. In this study the I-QoL score averages demonstrate the improvement of life quality in patients through the post and 3rd month average scores comparison with the pretreatment period scores. I-QoL is a recently developed method for evaluating primarily the effect of urinary incontinence on life quality²⁶⁾.

In conclusion a multidisciplinary study is necessary for patients with genuine stress incontinence and for the treatment of it a nonoperative treatment should be applied primarily. We think that among the possible treatments TVES may be a safe non-invasive and effective treatment.

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