Clinical and urodynamic evaluation of women with detrusor instability before and after functional pelvic floor electrostimulation

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Summary

Detrusor instability is the second most frequent cause of female urinary incontinence. There are many therapeutic options, including non-invasive and surgical procedures. In this study, we evaluated the effects of pelvic floor vaginal electrostimulation using equipment designed in our institution, over three consecutive months, for treatment of 29 women with detrusor instability. After treatment 22 patients (76%) considered themselves cured or symptomatically improved; seven patients (24%) had no change in symptoms after therapy. There was objective cure and improvement in ten (34.5%) and in eight (27.5%) patients, respectively, and the urodynamic parameters did not change in 11 patients (38%). Electrical stimulation resulted in a gradual decrease in the number of urinary leakage episodes and increase in maximum cystometric capacity in first desire to void and in urinary volume.

Key words: Detrusor instability; Electrostimulation; Urinary incontinence.

Introduction

Detrusor instability is found in 30% to 65% of the adult women and is the second leading cause of urinary incontinence [1-3]. In this condition detrusor muscle contraction occurs during bladder filling, spontaneously or is caused by certain maneuvers (e.g. cough), while the patient attempts to inhibit micturition [4]. The pathophysiology of detrusor instability is not completely understood, but may be a functional disorder involving central or peripheral urinary reflex control [5].

The parasympathetic nervous system is responsible for the excitatory impulse control of bladder musculature [6]. The primary action of the sympathetic nervous system is to facilitate bladder filling [7]. Imbalance can lead to detrusor instability, with therapy possibilities including non-invasive or surgical procedures.

Several authors have recommended pelvic floor electrostimulation as the first therapeutic procedure for patients with detrusor instability [8, 9]. This technique promotes symptom improvement in 50% to 90% of the patients [9]. Electrostimulation activates inhibitory reflexes and activates sympathetic fibers in the pelvic ganglia and detrusor muscle. Electrostimulation also inhibits the central motor efferent fibers of the bladder and both pelvic and pudendal afferents from the bladder [10-12]. However, electrostimulation equipment is usually imported in emerging economic countries, increasing the cost of this therapeutic procedure.

The purpose of the present study was to evaluate the effects of vaginal electrostimulation of the pelvic floor as therapy for detrusor instability in women with equipment designed at our institution.

Revised manuscript accepted for publication May 27, 2003

Methods

Twenty-nine consecutive patients, with a mean age of 47 years (range 17 to 79 years) with urodynamic diagnoses of detrusor instability were identified from June 1997 to October 1999. Three patients had undergone previous surgeries for stress urinary incontinence. None were treated for detrusor instability within the six months prior to the beginning of this study; 12 patients (41%) were menopausal.

All patients underwent general and gynecological physical examinations. Urine analyses and cultures were performed for all patients before treatment.

Treatment outcomes were analyzed by patient self-assessment, frequency-volume charts and urodynamic studies. Those evaluations were performed prior to and also one week after the end of treatment. Definitions and patterns used were according to the Continence International Society Guidelines [4].

Electrostimulation was performed with equipment designed at our institution. This equipment is composed of a low tension generator, a pulse generator, a pulse controller, a switching circuit and an isolation system. A catheter with double metal rings (electrodes) positioned in the middle third of the vagina, with 20 Hz frequency and 1 msec pulse duration was used. Electric current was biphasic, intermittent (5 seconds of stimulus and 10 seconds of rest), with maximum intensity tolerated. Patients underwent 20 minutes of vaginal electrostimulation twice a week for three consecutive months. This study was approved by the Institutional Ethical Committee and all the patients signed a written informed consent.

For statistical analysis, calculation of summary measures (mean and standard error) with a boxplot type graphics was performed [13]. The paired Student's t-test was also utilized. To verify a behavior pattern of the "urine leakage" variable in frequency-volume charts, a variance analysis technique in temporal series using a Walsh-Fourier modified model was performed [13, 14]. For this analysis, the significance level was 0.01 or 1%. In all other tests, the rejection level of null hypothesis was 0.05 or 5% (alpha $\leq$ 0.05).

Results

After therapy, urinary leakage measured at cystometry was absent in ten (35%) patients. Some urinary leakage was observed in eight (28%) patients, however, urinary leakage volume was increased in 50%, compared to before electrostimulation. Cystometry did not change in 11 (38%) patients.

Values of maximum and mean flow rate, and time of micturition did not change, by uroflowmetry. However, a significant increase in urinary volume was observed after therapy (Table 1).

There was a gradual decrease in the number of episodes of urinary incontinence. This decrease began by the 22nd day; reduced by half on the 45th day with a reduction to zero on the 90th treatment day (Figures 1 and 2). There was a significant increase of vesical capacity at the first desire to void and maximum cystometric capacity.

Regarding subjective evaluation, seven (24%) patients considered themselves cured; 15 (52%) had symptomatic improvement and in seven (24%) no symptomatic changes were found. Urinary urgency resolved in 12 (41%) patients after electrostimulation.

Statistically significant differences were absent in the maximum urethral closure pressure and in urethral functional length after electrostimulation.

Table 1. — *Analysis of urodynamic parameters before and after vaginal electrostimulation .*

	Mean		Standard Error		p
	Prior	After	Prior	After	
Residues (ml)	4.5	3.6	1.3	1.9	0.65
VC1stDV (ml)	85.7	124.0	1.9	7.8	0.0026*
MCC (ml)	383.8	446.6	10.7	28.9	0.045*
V. loss (ml)	225.9	242.6	20.7	29.6	0.028
MPUC (cmH_2O)	68.2	77.5	5.4	4.9	0.10
FLU (cm)	2.26	2.43	0.18	0.15	0.42
Max. F. (ml/sec)	24.6	26.6	2.2	2.4	0.33
Urinary V. (ml)	249.7	329.1	31.9	29.0	0.065*
TTM (sec)	23.5	23.3	3.9	2.8	0.91
Med. F. (ml/sec)	21.4	21.7	4.3	4.1	0.89

VC1stDV: Vesical capacity at first desire to void; MCC: Maximum cystometric capacity; V. loss :Urinary leakage volume; MPUC: Maximum urethral closure pressure; FLU: Functional length of urethra; Max. F: Maximum urinary flow rate; Urinary V.: Urinary volume; TTM: Total time of micturition; Med. F.: Average flow rate; *: Statistically significant value.

Discussion

Anticholinergic drugs are commonly employed for detrusor instability. However, these drugs can cause undesirable side-effects and treatment discontinuation often occurs [15, 16].

Electrostimulation therapy is associated with high success rates and minimum side-effects. It can be used

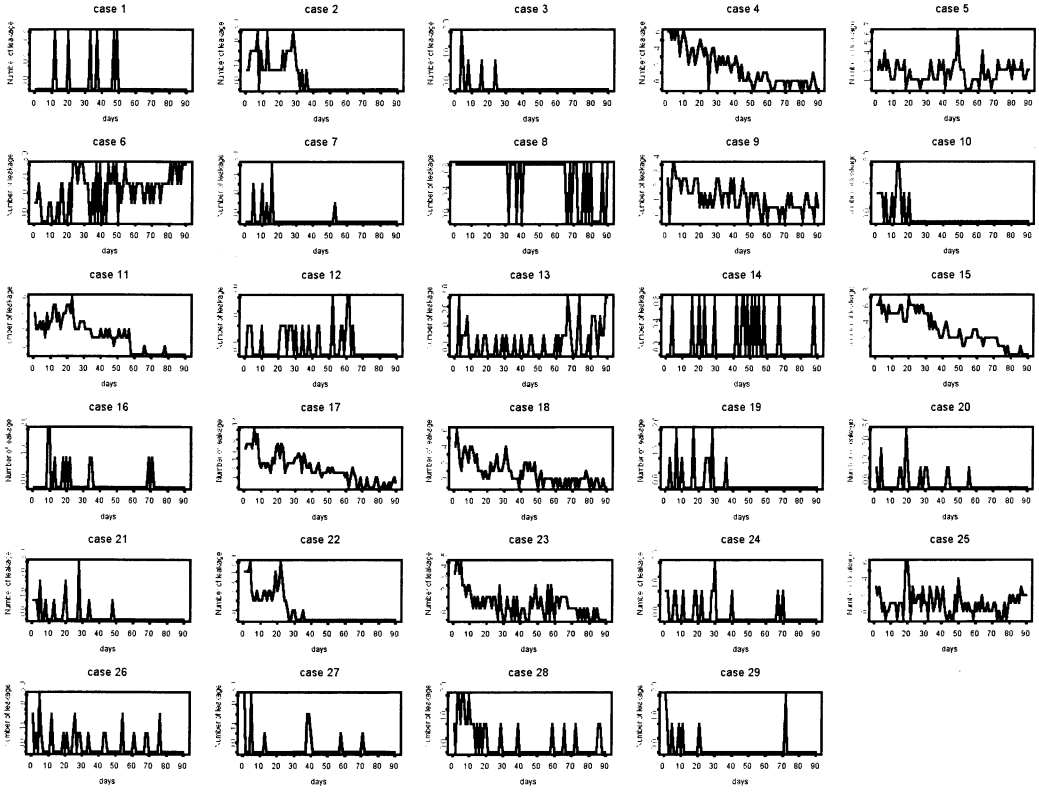

Figure 1. — Number of urinary loss episodes for each patient in 90 treatment days.

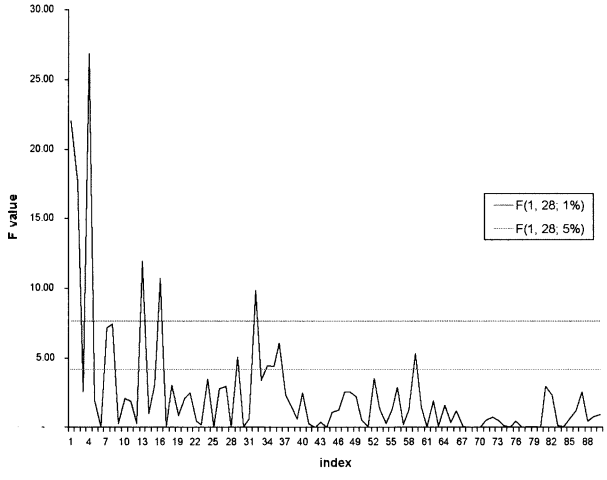

Figure 2. — Pattern of "urine leakage" variable in micturition in 90 treatment days.

Index	Sequence	Period in days	Fobs	F critical
1	0.011	90.0	22.07	7.64
2	0.022	45.0	17.65	7.64
4	0.044	22.5	26.86	7.64
13	0.144	6.9	11.96	7.64
16	0.177	5.6	10.70	7.64
32	0.355	2.8	9.84	7.64

Index: position where calculated statistical values were significant. Sequence: index/number of days observed. Period: 1/sequence, time for cycle to be concluded. Fobs: value of F statistic observed. F critical: value of F statistic for $\alpha = 1\%$. If Fobs > F critical $\Rightarrow$ it rejects Ho $\therefore \exists$ normal behavior.

with pharmacological treatment, increasing the efficacy and allowing lower dosages, thus decreasing the treatment costs. It is an excellent procedure whenever there is drug contraindication and intolerance, or pharmacological therapy failure [17]. In patients with mild and moderate urinary incontinence it is usually the first choice of treatment.

However, despite of all these advantages, pelvic floor electrostimulation is not widely used in our country because of the financial difficulty in obtaining the equipment, lack of training and the need for the participation of a multidisciplinary team, properly prepared to educate and encourage patients. Because of this, pharmacologic therapy is the first choice of treatment for detrusor instability in our country. This study was performed with patients who preferred electrostimulation to pharmacologic therapy. No one had contraindications to any type of these therapies.

This study showed that pelvic floor electrostimulation was effective in the treatment of detrusor instability. Clinical and urodynamic changes were evident and no patient reported any side-effects. We had a 50% reduction in equipment costs, with a success rate comparable with other authors [7, 9, 18, 19].

Conclusions

In women with vesical instability, pelvic floor electrostimulation using equipment designed at our institution, provided clinical improvement and a gradual decrease in the number of urinary leakage episodes. This technique increased the bladder capacity at the first desire to void, the maximum cystometric capacity and also the urinary volume.

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