Faradic Stimulation as an Adjunctive Treatment for Post Prostatectomy Incontinence

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ABSTRACT

The purpose of the current study was to determine the effectiveness of electrical stimulation in treating post-prostatectomy incontinence. Twenty volunteers suffering from post-prostatectomy incontinence participated in this study for a treatment period of one month. They were divided randomly and equally into two groups. Patients in the first group had been treated with sham faradic electrical stimulation, three times weekly, for one month. While patients in the second group had been treated with faradic electrical stimulation, for 30 min ,frequency of 30Hz, biphasic continuous wave, 200 µsec pulse width, three times weekly, for one month. Voiding cystometry and the urethral pressure profile were used to measure the outcomes before starting the study and after one month. The results of the first group showed non significant improvement in the bladder volumes, detrusor pressures voiding time or urethral pressure profile. While the results of the second group showed significant improvement in bladder volumes, detrusor pressures and the urethral pressure profile. The faradic stimulation was found to be an effective physical modality in treating post -prostatectomy incontinence.

INTRODUCTION

Men underwent prostatectomy for definite indications such as uncomplicated prostatism (e.g. weak stream, frequency, or nocturia) or urinary retention. There are many therapeutic modalities for management of symptomatic benign prostatic obstruction including drug, surgical, and physical treatment[1].

Prostatectomy was effective in relieving symptoms of lower urinary tract obstruction (63% reported a substantial improvement)[2].

Although most men's urinary incontinence was improved by surgery, some men who were dry pre-operative were incontinent after surgery. The incidence of urinary incontinence after prostatectomy is much higher and potentially devastating. It causes greater concern among patients than loss of sexual function[3].

Complications after prostatectomy may affect the patient's quality of life, as erectile dysfunction, retrograde ejaculation, impotence and urinary incontinence. Therefore loss of urine is a major problem that interferes with the patient's quality of life; its incidence at orgasm may diminish the pleasure and will make a man feel uncomfortable or ashammed, resulting in a loss of self confidence and avoidance of sexual contact[4].

Lower urinary tract symptoms (LUTS) in male include nocturia, frequency, urge

incontinence, stress incontinence, and post-micturition dribble. LUTS contribute to social and psychological problems which severely affect quality of life[5].

Urinary incontinence is a common distressing complication after prostatectomy, attributed to urethral insufficiency or detrusor instability, and it may result from sphincteric incompetence, related to sphincter injury, or from bladder dysfunction characterized by detrusor instability, and/or decreased bladder compliance[6].

All patients who undergo transurethral resection of prostate (TURP) for treatment of benign prostatic hyperplasia (BPH) have bladder outlet obstruction, as well as some who undergo radical prostatectomy[26]. Urodynamic studies proved that detrusor instability occurs in 53% to 80% secondary to benign prostatic hyperplasia (BPH), while it was 17% to 32% in men undergoing radical prostatectomy, instability directly related to age[7].

Incontinence could result from disruption of intrinsic urethral mechanism of the membranous urethra that maintains passive control of urine[2]. The proximal urethral sphincter is destroyed by all forms of prostatectomy, and the post-operative continence depends on the distal (external) mechanism, the distal sphincter mechanism may be relatively weak because of the prostatic effect offered by the obstructing prostatic tissue[8]. Post-micturition dribble occurs once voiding has been completed; it is attributed to imbalance between forces of voiding and outflow resistance near completion of micturition[9].

Stress incontinence results in an estimated 50,000 incontinent procedures performed annually[10]. Anti-incontinent procedures have a one-in five rate of failure even in the hands of master surgeons[11,12]. It is defined by the international continence society as a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable that it imposes a significant psychological impact on individuals, their families and care givers, and it results in lose of self-esteem; and a decrease in ability to maintain an independent life style[13].

Several physical therapy modalities are used in the treatment of urinary incontinence as, pelvic floor exercises, biofeedback, bladder training and functional magnetic stimulation[14].

Furthermore, faradic stimulation is an effective and a safer modality in the treatment of weak muscles. It is usually used for its low cost if compared to other modalities, easy application, and good results[15].

Therefore the aim of the present study was to identify the therapeutic benefits of faradic stimulation as a new trend to manage post-prostatectomy incontinence.

MATERIALS AND METHODS

Subjects

This study included twenty volunteers, who have had post-prostatectomy urinary incontinence. They were selected from the Department of Urodynamics of the "The National Institute of Urology and Nephrology. Their ages ranged from 45 to 60 years. The study was carried out from the period of September 2003 to April 2004. Patients were selected according to the following criteria.

- All of them were complaining from post-prostatectomy incontinence.
- They were free from genitourinary infections.
- They were neurologically free.
- They were non diabetic with no history of chronic relevant medical disease.

- They were free from active rectal lesions or infections.
- They had no pacemaker.
- All patients were informed that they might or might not appreciate sensation of electrical stimulation during the sessions. The patients were randomly divided into two equal groups; each group included ten patients.

Group (I) control group

Ten patients received placebo faradic stimulation (no current out put during application), thirty minutes, three days weekly, for one month.

Group (II) treatment group

Ten patients subjected to perianal faradic stimulation, thirty minutes, three days weekly, for one month.

All patients were subjected to

1- History taking: All patients underwent a physical examination and had a complete history taken, including previous urological symptoms as frequency, urgency, nocturia, or incontinence. The physical examination included neurological assessment of perianal sensation, anal sphincter tone and control, and a brief screening for any neurological factors as, Parkinson's disease, multiples sclerosis, stroke or previous operations (mainly pelvic surgeries).

2-Urologic examination: Urologic examination was carried by the urologist Department of the National Institute of Urology and Nephrology, to exclude any genitourinary infection that might cause urinary incontinence. Routine laboratory investigations, mainly fasting and postprandial blood glucose, complete urine analysis were carried out to exclude diabetes mellitus, urinary tract infection as well as renal infection.

3-Urodynamic studies: Urodynamic studies were carried by the staff of urodynamic unit of the National Institute of Urology and Nephrology, to confirm the diagnosis of post-prostatectomy incontinence by voiding cystometry.

Measuring Equipment

DANTIC UD 5000/5500 Urodynamic investigation system-Megamed- Germany. This equipment was used to perform urodynamic investigations such as voiding cystometry, and urethral pressure profile. All patients were subjected to multichannel cystometry before starting the study and at the end of the study (after one month).

THERAPEUTIC EQUIPMENT

Electrical Stimulator Unit

It was applied using the Sonopuls-992(ENRAF NONIU); made in Holland by Dimeq Bu.

- Technical adjustments: The following parameters of the electrical stimulator unit were used:
- Wave form: Biphasic continuous rectangular.
- Pulse width: 200 µsec.
- Frequency: 30 Hz.
- Duration: 30 min.

MEASUREMENT PROCEDURES

Patient preparation

The patients were instructed to empty the bladder as completely as possible.

Technique

- Patients were placed on the examination couch in the crook lying position

- A sterile sheet was placed under the external genitalia.
- Catheterization with a single lumen catheter was applied using a sterile technique and the Y-piece was mounted on the catheter then one prong was connected with the manometer connecting tube and the other via a damping tube to the infusion pump.
- Rectal balloon catheter was inserted to record intra-abdominal pressure.
- The system was emptied from air.
- Infusion of 37 ºC warm, sterile normal saline (at a medium rate of 50 ml/min) to fill the bladder was performed and recording was started.
- The patient was instructed to state when he first began to feel bladder filling (first desire to void).This event was marked on the curve of voiding cystometry.
- The patient was instructed to suppress the urge to urinate and to state when the urge became so strong and he felt a strong desire to urinate (cystometric bladder capacity).This event also was marked on the curve of voiding cystometry and infusion was stopped.
- The patient was asked to cough as a provocative test for detrusor instability then he was instructed to urinate.
- The catheter was withdrawn at a constant rate (less than 5mm/sec).

Therapeutic Procedures for the treatment group (group II)

- All subjects in the treatment group were asked to evacuate their bladder before starting the treatment session to be sure that they were relaxed and comfortable during the session.
- The therapist washed his hands and weared a sterile disposable glove to start the treatment session.
- The perianal area was cleaned by using savlon lotion, and then the electrodes were placed to this area (electrodes were placed perianally-1cm in both sides of anus).
- The lead cable was connected properly to the stimulator unit.
- Parameters of the stimulator unit were adjusted as, the frequency was 30 Hz, pulse width was 200 microseconds, duration was 30 min, wave form was biphasic continuous stimulation, and intensity was adjusted to the maximum that the patient can tolerate, so that it produced a non-painful strong pelvic floor muscle contraction. The frequency of application was three days weekly for four weeks

RESULTS

Bladder Volumes

Table (1) and figure (1) showed the mean values of bladder volumes for the control and treatment groups. Thus in group I the mean value of bladder volume at 1st desire to void was 88.5± 30.52 pretreatment while it was 101.5 ml ± 22.94 reflecting a significant difference ($P<0.05$), while the bladder volume at maximum cystometric capacity was 209.5 ml ± 37.67 pretreatment and it was 219.4 ml± 39.45 with a non significant difference ($P>0.05$). On the other hand the results of the second group showed that the volume at 1st desire was 104.7 ml ±19.46 pretreatment and it was148.3 ml ±35.27 post-treatment showing a significant difference ($P<0.05$), and the volume at cystometric capacity was232.3 ml ± 40.28 pretreatment and it was 319.4 ml ±78.956 post-treatment showing a significant difference ($P<0.05$).

Table (1): The bladder volumes for both groups pre and post treatment.

Statistics	At 1st desire to void				At cystometric capacity			
	Control group		Treatment group		Control group		Treatment group	
	Pre	Post	Pre	post	pre	post	pre	post
Mean(ml)	88.5	101.5	104.7	148.3	209.5	219.4	232.3	319.4
SD±	30.52	22.94	19.46	35.27	37.67	39.45	40.28	78.956
"t" value	-2.696		-3.944		-2.14		-4.623	
"p" value	0.02*		0.003*		0.061		0.001*	

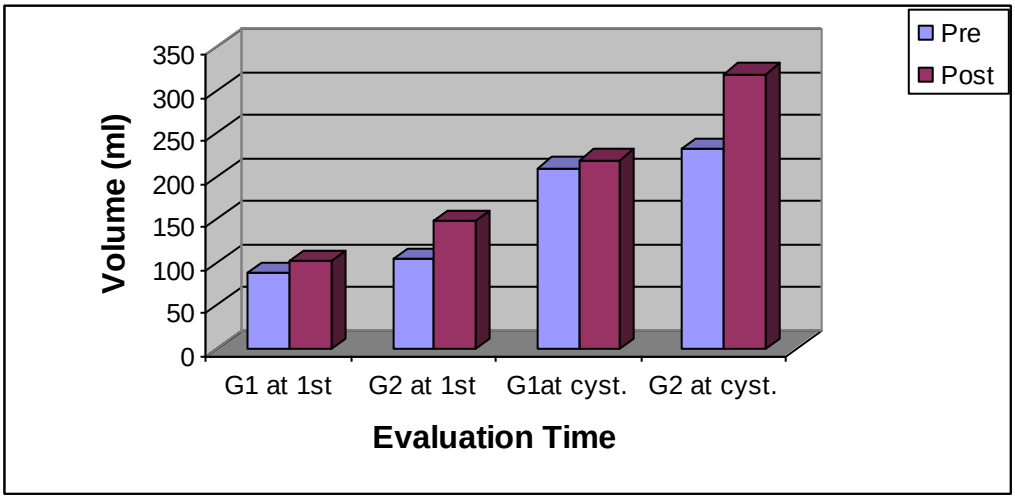

Fig. (1): The mean values of bladder volumes for both groups.

Detrusor pressures: Table (2) and figure (2) showed the mean values of detrusor pressures for the control and treatment groups. As regards in group I detrusor pressure at cystometric capacity was 27.6 cm H2o±7.26 pretreatment and 37.2 cm H2o ±18.63 with a statistically non significant difference (P>0.05), the pressure at maximum flow rate was 34 cm H2o ±15.46 pretreatment and it was 32.6 cm H2o ±16.4 post-treatment with a non significant difference (P>0.05). The results group II showed that the detrusor pressure at cystometric capacity was 34 cm H2o ±12.63 pre-treatment and 23.1 cm H2o ±9.89 post-treatment with a significant difference (P<0.05), while the detrusor pressure at maximum flow rate was 30.87±11.9 pre-treatment and 25.1 cm H2o ±9.5 post-treatment with a non significant difference (P>0.05).

Table (2): The detrusor pressures (cm H2o) for both groups pre and post treatment.

Statistics	At 1st desire to void				At cystometric capacity			
	Control group		Treatment group		Control group		Treatment group	
	Pre	Post	Pre	post	pre	post	pre	post
Mean(ml)	27.6	37.2	34	23.1	34.0	32.6	30.87	25.1
SD±	7.26	18.63	12.63	9.89	15.46	16.406	11.9	9.5
t- value	-1.589		2.52		0.864		-0.012	
P- value	0.146		.03*		0.410		0.9	

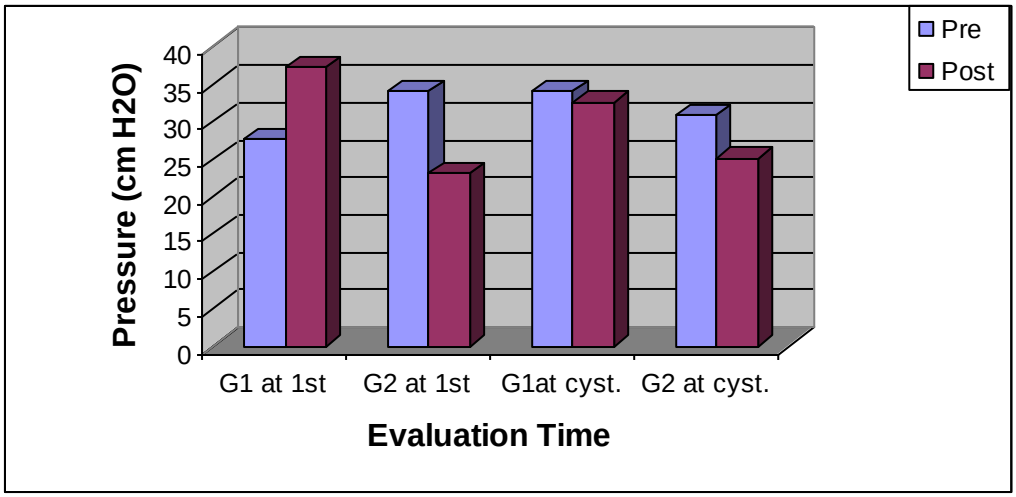

Fig. (2): The mean values of detrusor pressures for both groups pre and post treatment.

Maximum Flow Rate (Q_{max})

Table (3) and figure (3) showed the mean values of maximum flow rate for the control and treatment groups. Therefore in group I maximum flow rate was7.37±4.45 pre-treatment and 7.64 the detrusor pressure at maximum flow rate4.54 post-treatment with a non significant difference (P>0.05). In group II maximum flow rate was 8.18±3.87 pre-treatment and 12.8±5.44 with a statistically significant difference (P<0.05).

Table (3): The maximum flow rate for both groups pre and post treatment.

Statistics	Control group		Treatment group	
	pre	post	Pre	post
Mean	7.37	7.64	8.180	12.81
SD±	4.45	4.54	3.871	5.44
"t" value	-0.379		-2.260	
"p" value	0.714		0.026*	

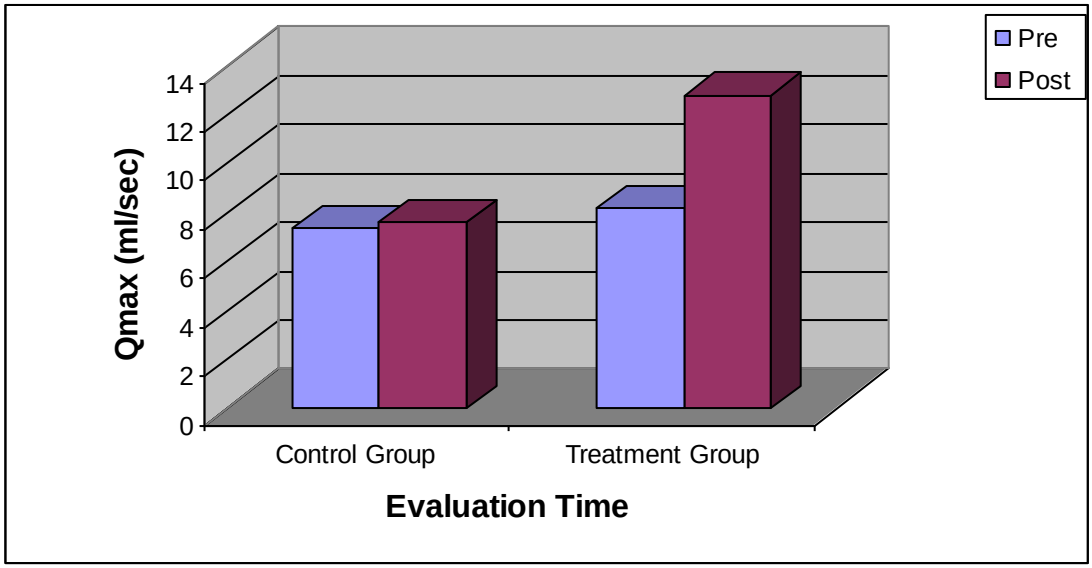

Fig. (3): The mean values of maximum flow rate for both groups pre and post treatment.

DISCUSSION

Rehabilitation of bladder dysfunction is a combination of medical, surgical and physical therapy modalities, the medical treatment either to strengthen or to lower the detrusor muscle contraction, or to strengthen or lower the bladder outlet resistance[16,17].

On the other hand the surgical treatment of such problem includes; the treatment of the primary cause as removing the enlarged prostate, injection of bulking agents as collagen, or the implantation of artificial urethral sphincter[11].

According to Schmidt, neural stimulation is being used more frequently as a modality of treatment of a wide spectrum for voiding dysfunction that failed to respond to conventional pharmacological manipulations[18].

It was reported that long-term electrical stimulation of the peripheral nerves with sufficient intensity to result in an appropriate response in the effector organ did not induce neural damage[2].

In 2001 Sabour et al., reported that there was a two fold effect of electrical stimulation when applied to the pelvic floor; contraction of the pelvic floor muscles with inhibition of bladder overacitvity[14].

On the other hand it was suggested that electrical stimulation of the pelvic floor reduced symptoms of urinary urgency or frequency; the mechanism might involve decreasing bladder overacitvity by stimulating peripheral nerves that represent the same sacral (S_3) area[4].

It was believed that the bladder has three pathways which are debated, at low bladder filling volumes by direct stimulation of the hypogastric nerve through activation of the sympathetic fibers at maximal bladder filling, this is induced by direct stimulation of the nuclei of the pudendal nerve in the spinal cord, as well as a supra-spinal inhibition of the detrusor[19].

It was noticed that during electrical stimulation of the pudendal nerve in the cat model there were relaxation of a contracted detrusor[20].

In the present study the bladder volumes (at the first desire to void and at the cystometric capacity) showed significant improvement between both groups post-treatment which reflected improvement in the bladder adaptation to the increased volume, and such results are in agreement with the work of many investigators[3,21].

The detrusor pressure at cystometric capacity revealed a statistically significant difference for the treatment group while it was of a non significant value for the control group, by comparing results of both groups post-treatment, it revealed a significant value for the detrusor pressure at cystometric capacity, while at maximum flow rate it showed a clinical improvement but statistically was not significant and this was in agreement with the work of many authors[13,22,23,24].

The maximum flow rate was significantly improved post-treatment, while there was no significant difference in the detrusor compliance. This might be due to prolonged outlet obstruction and resistance pre-operative, these results were supported by many researchers[13,15,25,26,27].

Conclusion

Faradic stimulation is an effective physical therapy modality to relief symptoms of voiding dysfunction after prostatectomy.

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الملخص العربى

التنبية بالتيار الفارادى كعلاج مساعد للتبول اللاارادى بعد استئصال البروستاتا

تهدف هذه الرسالة الى تقييم دور التنبية بالتيار الفارادى فى علاج السلس البولى للمرضى بعد استئصال غدة البروستاتا وقد أجريت هذه الدراسة على عشرين متطوعا تتراوح أعمارهم بين45 الى 60 عاما يعانون من التبول اللاارادى بعد استئصال البروستاتا وقد تم تقسيمهم عشوائيا الى مجموعتين متساويتين،المجموعة الاولى تلقت التنبية بالتيار الفارادى الايحائى بواقع ثلاث جلسات أسبوعيا و لمدة شهر، بينما المجموعة الثانية عولجت باستخدام التنبية بالتيار الفارادى الفعلى بوا قع ثلاث جلسات أسبوعيا و لمدة شهر. وقد استخدم ت اختبارات ديناميكية التبول لقياس مدى التحسن فى المجموعتين وقد تم القياس قبل بدء التجربة وبعد انتهائها، وقد أظهرت نتائج المجموعةالاولى (المجموعة الضابطة) عدم تحسن فى حجم البول الموجود فى المثانة،و ضغط المثانة.بينما أظهرت نتائج المجموعة الثانية (مجموعةالاختبار) تحسنا ملحوظا فى حجم المثانة و الضغط فيها. وطبقا لهذه النتائج نستخلص أن التنبية بالتيار الفارادى ذ و فاعلية فى علاج التبول اللاارادى بعد استئصال البروستاتا.