

Research Article

ELECTRICAL STIMULATION AS AN ADJUNCTIVE TREATMENT FOR PENILE REHABILITATION AFTER OPEN RADICAL PROSTATECTOMY.

Fayiz F. Elshamy*¹, Ashraf H. Mohammed², Hesham M. Ban³

¹Faculty of physical Therapy, Kafelsheikh University.

²Faculty of physical Therapy, Cairo University.

³Consultant of urology, Ain Shams Specialized Hospital, Ain Shams University.

CORRESPONDENCE ADDRESS: Fayiz F. Elshamy

ABSTRACT

To evaluate the effectiveness of electrical stimulation on erectile dysfunction post-open radical prostatectomy. Thirty patients, diagnosed as having erectile dysfunction, their ages ranged from 50 to 65 years, selected randomly from outpatient clinic of urology, Ain Shams specialized hospital, equally divided into two groups (A&B). Patients in group (A) were treated by placebo electrical stimulation. Patients in group were treated by electrical stimulation. This study was conducted in the outpatient clinic, department of physical therapy for surgery, faculty of physical therapy, Cairo University from February 2012 to January 2013. All patients were assessed before and after treatment by international index of erectile function. The treatment program extended up to 12 weeks, three sessions/ week and 20 minutes/ session. Group (A): There were no significant differences in mean values of patient's Erectile Dysfunction ($P=0.07$) between before and after the placebo electrical stimulation. Group (B): There were significant differences in mean values of patient's Erectile Dysfunction ($P=0.04$) between before and after the electrical stimulation. There were a significant difference ($P=0.04$) at the end of the treatment program between both groups (A&B). Electrical stimulation appears to be effective in the treatment of erectile dysfunction post-open radical prostatectomy.

Key Words: Electrical stimulation; erectile dysfunction; international index of erectile function.

INTRODUCTION:

Erectile Dysfunction (ED) is the persistent inability to attain and maintain an erection sufficient to permit satisfactory sexual performance⁽¹⁾. Erectile function becomes impaired immediately following radical prostatectomy and it's thought to be secondary to the damage of cavernous nerves, leads to neuropraxia, which can be caused by mechanically induced nerve stretching that may occur during prostate retraction, thermal damage to nerve tissue caused by electrocautery, ischemia of the nerves secondary to disruption of blood supply while attempting to control surgical bleeding, and local inflammatory effects associated with surgical trauma⁽²⁾. With most meticulous nerve-sparing dissection, some degree of neuropraxia is unavoidable because of the close proximity of the nerves to the prostate gland. These nerves tend to recover slowly; it may take as long as 3 years for them to reach a new baseline functional status. Absence or decreased erection and penile size ensue before recovery of the cavernous nerve⁽³⁾. Reduction in arterial inflow has been associated with the ligation of accessory internal pudendal arteries during prostatectomy. Combination of nerve

damage with decreased arterial inflow may intensify hypoxia and ultimately lead to apoptosis or programmed cell death, which has recently been linked to the pathophysiology of post prostatectomy ED⁽⁴⁾. Rat with cavernous nerve crush and bilateral internal iliac arteries ligation had significant decrease of intracorporeal pressure, loss of cavernous smooth muscle, and neural staining. Both intrinsic and extrinsic apoptotic pathways were activated in rats whose cavernous nerves were disrupted⁽⁵⁾. Lack of erections leads to poor oxygenation of the corporal bodies, eventually progressing to cavernosal fibrosis and causing a venous leak seen clinically as venogenic ED. Penile fibrosis may result when human penile smooth muscle cell is exposed to prolonged hypoxic environment, as commonly occurs after prostatectomy^(6, 7). Regardless of the surgical technique, the removal of the prostate may result in an almost obligatory period of dormancy of the nerves that govern the functional aspects of erection. This situation may lead to a loss of daily and nocturnal erections associated with persistent failure of cavernous oxygenation and secondary erectile tissue damage resulting from the production of pro-apoptotic factors (ie, loss of smooth muscle) and pro-fibrotic factors (ie, an increase in collagen) within the corpora cavernosa^(8, 9). Low oxygen tension in human cavernosal tissue inhibits production of prostaglandin-E (PGE). PGE inhibits collagen formation by inhibiting TGF- β that induces collagen synthesis. With the inhibition of PGE, TGF- β is allowed to induce connective tissue synthesis. The trabecular smooth muscle is then replaced with collagen, which leads to the loss of veno-occlusive mechanism⁽¹⁰⁾. Venous leakage is a relatively common cause of erectile dysfunction which meaning that the arterial inflow of blood into the cavernosal bodies is adequate but blood leaks out simultaneously due to a damaged veno-corporo-occlusive mechanism that is caused by the insufficient venous occlusion of the cavernosal smooth muscle⁽¹¹⁾. Several options are currently available for managing erectile dysfunction following radical prostatectomy. These options include both pharmacologic (have its own side effects that may not be tolerated by the patients) and non-pharmacologic (devices or mechanical methods) interventions. These options are understood to be conventional management options or erection aids. It is acknowledged that these options generally produce temporary, repetitive means for an erectile response and would seem artificial. Nevertheless, they do permit the opportunity for sexual intercourse for men who experience incomplete or delayed recovery of erectile function following the surgery⁽¹²⁾.

Therefore, the aim of this prospective study is to evaluate the effectiveness of electrical stimulation as a non-invasive technique in treatment of newly developed ED after open radical prostatectomy

MATERIALS AND METHODS:

A total of 30 patients diagnosed as having erectile dysfunction(ED) which settled for at least 1 year after radical prostatectomy and done for low risk prostate cancer patients, were selected randomly from outpatient clinic of urology, Ain Shams specialized hospital, divided into 2 equal groups (A&B). Patients in group (A) were treated by placebo electrical stimulation. Patients in group (B) was treated by electrical stimulation. Patients in both groups (A&B) were not take any medications during the treatment program. Their age was ranged from 50 to 65 years. Their body mass index was less 30 kg/m². Patients were excluded who exhibited previous history of ED before operation, high risk prostate cancer, previous pelvic dissection operation and previous history of radio or chemotherapy for previous malignancy, history of priapism, pelvic neuropathy, penile skin lesions/ulcers and diabetes. This study was conducted in the outpatient clinic, department of physical therapy for surgery, faculty of physical therapy, Cairo University, Egypt. The design of this study was a clinical

controlled trial. The approval for this study was obtained from the ethical committee of the university, Informed consent form had been signed from each patient before participating in the study. The study was done from February 2012 to January 2013. Patients were empirically and equally divided into two groups. Group A was the control group and treated by placebo electrical stimulation while we were switching off the apparatus during sessions. Group B was treated by electrical stimulation 3 sessions per week, 20 min for each session for 12 weeks. The electrical stimulation was carried out by using the Erec-fit stimulation system with two monopolar self-adhesive electrodes of 5 x 150 mm. The pre-lubricated electrodes were circularly placed on the penis and the current was transferred to the inner muscular system and maximum tolerance level was reached. The stimulation is carried out using the following parameters

Pulse current: 120 mA.
Frequency: 30 Hz
Pulse/Pause Ratio: 1: 2
Contraction time: 3 seconds

The primary outcome measure validate erectile function domain of the International Index of Erectile Function (IIEF), there is six questions relating to erectile function in this domain (for example, 'Over the past 4 weeks, how often were you able to get an erection during sexual activity?'), and each ranked 0–5 points:

- 5 = almost always or always
- 4 = most times (much more than half the time)
- 3 = sometimes (about half the time)
- 2 = a few times (much less than half the time)
- 1 = almost never or never
- 0 = no sexual activity

It was suggested that an increase in six points in this domain indicates a clinical improvement. It was used to evaluate 6 questions of erectile function before and after 12 weeks then every three months for a year from treatment as a follow up approach .

The collected data was statistically analyzed by using Mann-Witney, Wilcoxon matched pairs test and descriptive statistics: mean, standard deviation and percentage. Statistical significance level of 0.05 would be used within this study.

RESULTS :

All data had been collected and statistically analyzed and presented under the following headings;

Physical characteristics of the patients:

In this study, 30 patients with erectile dysfunction(ED) which settled for at least 1 year after radical prostatectomy were divided randomly into two equal groups (A&B). Group (A): 15 patients were included in this group; the mean age and BMI were (58.33±2.09) years and (27.38±1.49) Kg/m². Group (B): 15 patients were included in this group; the mean age and

BMI were (58.06 ± 2.01) years and (27.73 ± 1.45) Kg/m². There was no significant difference ($P = .9$ and $.83$) between both groups (A&B) regarding their ages and BMI respectively.

Erectile Dysfunction(ED) by International Index of Erectile Function (IIEF):

Group (A): There were no significant differences in patient's Erectile Dysfunction ($P = .07$) between mean values of patient's Erectile Dysfunction before (11.86 ± 3.34) and after (10.91 ± 3.1) the placebo electrical stimulation. Group (B): There were a significant differences in patient's Erectile Dysfunction ($P = .04$) between mean values of patient's Erectile Dysfunction before (12.1 ± 2.51) and after (21.3 ± 4.12) the electrical stimulation (Table 1 & Figure 1). When comparing between the mean values of patient's Erectile Dysfunction between both groups (A&B) post treatment, there were a significant difference ($P = .04$) at the end of the treatment program (Table 2 & Figure 2).

Table (1): Mean values of International Index of Erectile Function (IIEF) at pre and post treatment for both groups(A&B).

	Control group (A)		Stimulation group (B)	
	Pre	Post	Pre	Post
Mean	11.86	10.91	12.1	21.3
\pm SD	± 3.34	± 3.1	± 2.51	± 4.12
t. value	19.2		10.9	
p. value	0.07		0.04	
Significance	Not significant		Significant	

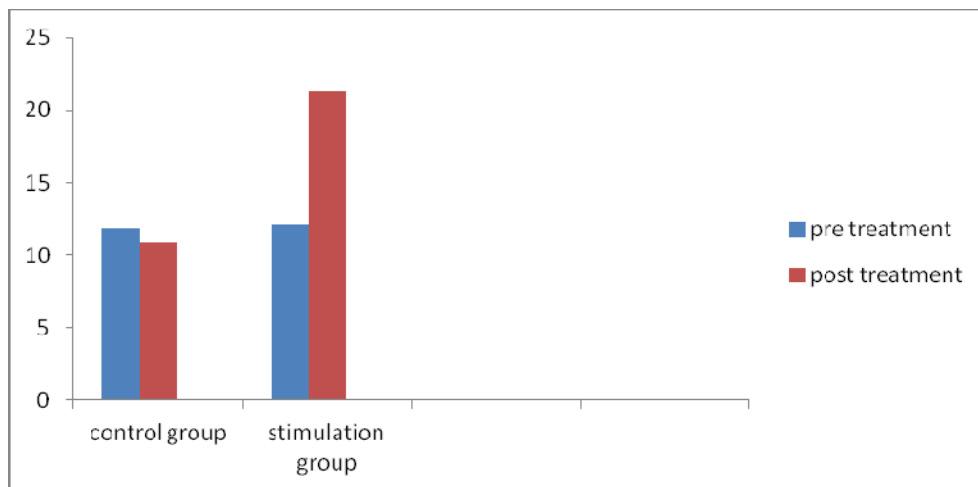


Figure (1): Mean values of (IIEF) at pre and post treatment for both

groups(A&B).

Table (2): Mean values of International Index of Erectile Function (IIEF) at post treatment for both groups(A&B).

	Control group	Stimulation group
Mean	10.91	21.3
± SD	± 3.1	± 4.12
t. value	17.12	
p. value	0.04	
Significance	Significant	

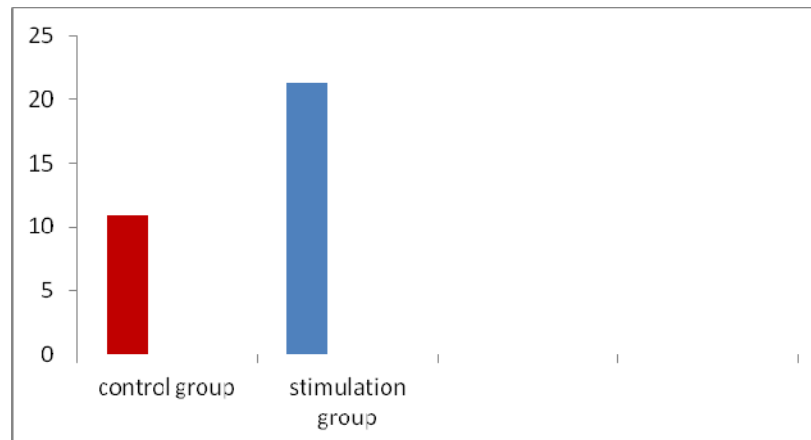


Figure (2): Mean values of (IIEF) at post treatment for both groups(A&B).

DISCUSSION:

Several preventive and therapeutic strategies for the preservation and recovery of post-RP ED are available in the everyday clinical setting. However, no specific recommendation emerges regarding the optimal rehabilitation or treatment regimen. It is of major importance to stress that postoperative ED rehabilitation could mean interventions designed to achieve faster and better natural EF recovery, but the term could also mean interventions that preserve sexual continuity without necessitating natural ED. Rehabilitation and treatment, as early as possible, are undoubtedly better than leaving the erectile tissue to its unassisted, unfavorable fate^(13, 14). Sexuality underlies socio economic and cultural fluctuations, and it is not surprising, that studies which have been carried out at different times and in various cultures,

produce differential results⁽¹⁵⁾. The current study was conducted to clarify the effectiveness of electrical stimulation as a treatment for post-prostatectomy erectile dysfunction.

The results of the current study revealed a significant improvement of erectile function in response to electrical stimulation manifested by statistical improvement of IIEF in the stimulation group than that in the control group ($p < 0.05$). By applying electrical stimulation with appropriate stimulation parameters the insufficiency of the cavernosal smooth muscle can be treated. The muscle will be strengthened and the resulting increase of muscular mass and physical strength can lead to an improvement of the functioning of the venous occlusion mechanism and enable the required filling of the corpus cavernosal bodies with blood. The strengthening of the muscle is usually achieved within 90 days by applying regular stimulations. The stimulation itself causes no erection⁽¹⁶⁾. The current results are parallel with the work done by Kayigil et al.⁽¹⁷⁾, who concluded that electrical stimulation plays an important role in rehabilitation of non-neurogenic ED. The gained results are supported by the work of Van Kampen et al.⁽¹⁸⁾, who explained that; electrical stimulation has a significant effect in the treatment of erectile dysfunction. Our results come in line with that of Derouet et al.⁽²⁾, who revealed that penile electrical stimulation has a great role in rehabilitation of post-prostatectomy erectile dysfunction. The current results are supported by the results of another work, which approved that electrical stimulation has an important role as a non-invasive adjunctive therapy for ED⁽¹⁹⁾.

A major limitation of our study was the small size of the group, recruiting subjects for this type of study was difficult because the psycho-physiological, social and culture level of each patients.

CONCLUSION:

It could be concluded that penile electrical stimulation appears to be effective in treatment of post-prostatectomy ED.

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