Electrical Stimulation of Posterior Tibial Versus Sacral Nerve in Urinary Incontinence Post Prostatectomy

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Abstract

Background: Urinary incontinence followed surgical prostatectomy generates embarrassment and depression; patients avoid social gatherings and lose self-confidence so it is a great concern for patients and a challenging problem for clinicians.

Objectives: To investigate the effect of electrical stimulation of posterior tibial versus sacral nerve in urinary incontinence post prostatectomy.

Methodology: Thirty adult male patients who complaint from urinary incontinence post prostatectomy were participated in this study, their ages ranged from 45 to 65 years. They were randomly divided into two equal groups. Group (A): Received 12 weeks of treatment with posterior tibial nerve electrical stimulation with frequency 1-10HZ, pulse with 200µsec, intensity according to the patient's tolerance, duration of treatment 15 minutes three times/week in addition to routine medical treatment and traditional care (fesoterodine, tolterodine and oxybutynin) while Group (B): Received 12 weeks of treatment with sacral nerve electrical stimulation with frequency 1-10HZ, pulse with 200µsec, intensity according to the patient's tolerance, duration of treatment 15 minutes three times/week in addition to routine medical treatment and traditional care (fesoterodine, tolterodine and oxybutynin).

Results: Both posterior tibial and sacral nerve stimulation were effective, minimally invasive option for treatment of patients complaining of post prostatectomy urinary incontinence. Both posterior tibial and sacral nerve stimulation produced subjective improvements which are improvement of quality of life parameters, leakage episodes and frequency.

Conclusion: There was a significant decrease in mean values of Revised Urinary Scale Results (RUIS) of posterior tibial nerve stimulation group compared with sacral nerve stimulation group post treatment.

Key Words: Posterior tibial nerve – Electrical stimulation – Sacral nerve – Urinary incontinence – Post prostatectomy.

Introduction

THE International Continence Society (ICS) defines Urinary Incontinence (UI) as any involuntary urine leakage. Stress Urinary Incontinence (SUI) is defined as involuntary leakage upon effort or exertion, or upon sneezing or coughing. Urgency Urinary Incontinence (UUI) is the complaint of involuntary loss of urine associated with urgency; and Mixed (Urinary) Incontinence (MUI) is the complaint of involuntary loss of urine associated with urgency and also with effort or physical exertion, or upon sneezing or coughing [1].

Benign Prostatic Hyperplasia (BPH), is a benign increase in size of the prostate. BPH involves hyperplasia of prostatic stromal and epithelial cells, resulting in the formation of large, fairly discrete nodules in the transition zone of the prostate. When sufficiently large, the nodules impinge on the urethra and increase resistance to flow of urine from the bladder. This is commonly referred to as "obstruction," although the urethral lumen is no less patent, only compressed. Resistance to urine flow requires the bladder to work harder during voiding, possibly leading to progressive hypertrophy, instability, or weakness (atony) of the bladder muscle [2].

Patients who undergo a prostatectomy have an increased risk of leaking small amount of urine immediately after surgery and for the long-term [3].

Functional Electrical Stimulation (FES) is a technique that uses electrical currents to activate nerves innervating extremities affected by paralysis resulting from Spinal Cord Injury (SCI), head injury, stroke and other neurological disorders. FES is primarily used to restore function in people...
with disabilities. It is sometimes referred to a Neuromuscular Electrical Stimulation (NMES) [4].

Neuromodulation has been reported to be effective for the treatment of stress and urgency urinary incontinence. Neuromodulation in highly selected patients can offer improvement in patient quality of life. Posterior tibial nerve stimulation look to be an easy and less expensive way to reach satisfactory results [5].

**Material and Methods**

Thirty male patients who were previously diagnosed as post prostatectomy urinary incontinence were participated in this study. Their ages ranged from 45 to 65 years. They were selected from Urology Department, Quesna Central Hospital. The study was conducted from January 2015-July 2015. They were randomly assigned into two equal groups (15 patients for each group). Group (A) (posterior tibial nerve stimulation group): Received 12 weeks of treatment with posterior tibial nerve electrical stimulation with frequency 1-10 HZ, pulse with 200 g sec, intensity according to the patient’s tolerance, duration of treatment 15 min. three times/week in addition to routine medical treatment and traditional care while (fesoterodine, tolterodine and oxybutynin) Group (B) (sacral nerve stimulation group): Received 12 weeks of treatment with sacral nerve electrical stimulation with frequency 1-10 HZ, pulse with 200 g sec, intensity according to the patient’s tolerance, duration of treatment 15 min three times/week in addition to routine medical treatment and traditional care (fesoterodine, tolterodine and oxybutynin).

**Inclusive criteria:** All patients diagnosed as urinary incontinence, their age ranged between 45-65 male patients and all patients received the same medical treatment.

**Exclusive criteria:** All patients are free from diabetes mellitus, urinary tract infection, renal diseases, eurologic diseases and allergic reaction for electrical stimulation.

**Procedures:**

**Evaluative procedures:**

Revised Urinary Incontinence Scale (RUIS) conducted one time at the administration and another after the end of treatment sessions. People respond to the Revised Urinary Incontinence Scale (RUIS) questions by selecting one particular response option from the set of standard response options for each question. These response options can then be scored by using the numbers presented in brackets to the right of each response option.

The RUIS total score is then calculated by adding up a person’s score for each question. Adding the score for each of the five questions results in a possible score range of 0-16 [6].

The RUIS contains the following items:

- Do you experience and if so how much are you bothered by:
  - 1- Urine leakage related to the feeling of urgency.
    - Not at all 0.
    - Slightly 1.
    - Moderately 2.
    - Greatly 3.
  - 2- Urine leakage related to physical activity, coughing or sneezing.
    - Not at all 0.
    - Slightly 1.
    - Moderately 2.
    - Greatly 3.
  - 3- Small amounts of urine leakage (drops).
    - Not at all 0.
    - Slightly 1.
    - Moderately 2.
    - Greatly 3.
  - 4- How often do you experience urine leakage?
    - Never 0.
    - Less than once a month 1.
    - A few times a month 2.
    - A few times a week 3.
    - Every day and/or night 4.
  - 5- How much urine do you lose each time?
    - None 0.
    - Drops 1.
    - Small splashes 2.
    - More 3.

The RUIS total score is then calculated by adding up a person’s score for each question. Adding the score for each of the five questions results in a possible score range of 0-16.

**Treatment procedures:**

All subjects of both Groups (A and B) had been asked to evacuate their bladder before starting the treatment sessions to ensure that they will be relaxed and comfortable during the session.

The therapists washed his hands and wear a sterile disposable glove before starting the treatment session.
Posterior tibial nerve stimulation (Group A):
1- With the patients sitting in a frog-leg position with the soles of the feet touching each other and the knee flexed. The medial aspect of the lower extremities was palpated and sensitive pressure point was identified approximately three-finger breadth cephalad from the medial malleolus. This point was about one finger-breadth posterior from the edge of the tibia.
2- A 34 gauge, solid stainless steel needle was advanced through the skin with the aid of an overlying plastic cylinder that was 3mm, shorter than the needle. Once the skin was pierced the cylinder was removed, and the needle was advanced approximately 3 to 4 cm posterior to the tibia.
3- The needle trajectory was 60 degrees cephalad from a perpendicular line along the length of tibia, and advanced toward the patients head.
4- A reference electrode was placed over the medial aspect of the calcaneus.
5- Proper needle placement was confirmed with the great toe flexion and or fanning of ipsilateral digits 2 through 5.
6- A stimulator was then connected to the needle and the ipsilateral reference electrode and stimulation parameters were:
   - Frequency is 1-10 Hz.
   - Pulse width is 200 µsec. Duration of treatment is 15 min. 3 times per week.
   - Intensity was adjusted according to the patient’s tolerance [7].

Sacral nerve stimulation:
The perianal area was cleaned by using salvon lotion, and the electrodes were placed to this area.

The lead wire was connected properly to the stimulator unit.

Parameters of the stimulator unit were adjusted as:
- Frequency is 1-10 Hz.
- Pulse width is 200 µsec. Duration of treatment is 15 min. 3 times per week.
- Intensity was adjusted according to the patient’s tolerance [8].

Statistical analysis:
In this study, the descriptive statistics (the mean and standard deviation) were calculated for all patients (Group 1 and Group 2). The mean and standard deviation was used as a kind of central tendency to describe a group of individuals with single measurement (descriptive statistics). Paired “t” test was used to compare the results pre and after treatment in the same group for each group, with level of significance (0.05) non descriptive statistics had been used for stability and compliance pre and after treatment [9].

Results
Data obtained from both groups prior and following the treatment program regarding the Revised Urinary Incontinence Scale (RUIS) and Incontinence Severity Index (ISI) were statistically analyzed and compared.

| Table (1): Comparison between pre and post treatment mean values of RUIS of Group A. |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                 | Pre X ± SD     | Post X ± SD    | MD              | % of improvement | t-value        | p-value        |
| RUIS            | 12.46±2.85     | 33.3±1.83      | 9.13            | 73.27           | 14.29          | 0.0001 S       |

| Table (2): Comparison between pre and post treatment mean values of RUIS of Group B. |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                 | Pre X ± SD     | Post X ± SD    | MD              | % of improvement | t-value        | p-value        |
| RUIS            | 13.26±2.28     | 5.33±1.67      | 7.93            | 59.8            | 11.67          | 0.0001 S       |

| Table (3): Comparison of post treatment mean values of RUIS between both Groups (A and B). |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                 | Group A X ± SD | Group B X ± SD | MD              | t-value        | p-value        |
| RUIS            | 3.33±1.83      | 5.33±1.67      | –2              | 3.11           | 0.004 S       |
The majority of male urinary incontinence seen is secondary to sphincter weakness following prostatic surgery. As there is a rising elderly population and increasing numbers of surgical interventions for prostate cancer, incidence of male incontinence is increasing. Hence, management of male incontinence has become a subject of increased interest for urologists. Various non-surgical and surgical approaches have been suggested for this devastating condition. Non-invasive therapies are suggested for early postoperative and mild incontinence. For surgical treatment the artificial urinary sphincter is still labeled the gold standard despite the introduction of several more minimally invasive treatments. However, as yet there is no consensus on the optimal timing and best modality for managing these men. Well designed, centrally funded clinical trials are required to establish which treatment modality to offer and when in the broad spectrum of male incontinence [12].

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. It was noticed 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 [13].

Electrical stimulation is an effective and safer modality in the treatment of bladder dysfunction, therefore electrical stimulation was strongly recommended due to its low cost if compared to other modalities, easy application and good results [14].

With regard to neuromodulation are Percutaneous Tibial Nerve Stimulation (PTNS) and Sacral Nerve Stimulation (SNS) nowadays widely adopted as a treatment which diminishes urge urinary incontinence [15].

Posterior tibial nerve electrical stimulation offers a nondestructive alternative for patients with urge incontinence caused by over active bladder that is refractory to conservative treatment modalities. Detrusor over activity inhibition is achieved by acute electrical stimulation of afferent somatic sacral nerve fibers by PTNS, the rational of treatment is based on the existence of spinal inhibitory systems that are capable of interrupting detrusor contraction [16].

Discussion

Urinary incontinence and overactive bladder are common conditions in the adult population, with impact on physical, psychological and social well-being, and represent an important burden to the economy of health services [10].

Anticholinergic therapy is first line treatment for Overactive Bladder (OAB) but is limited by side effects or lack of therapeutic goal attainment. Neurromodulation is an effective treatment alternative and its efficacy has been well established [11].

References


