

Benign Prostatic Hyperplasia Treatment with New Physiotherapeutic Device

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Purpose: Thermobalancing therapy, provided by Therapeutic Device, which contains a natural thermoelement, and is applied topically in the projection of the prostate, was aimed to improve blood circulation in the affected organ. We evaluated the effectiveness of new Therapeutic Device for the treatment of patients with benign prostatic hyperplasia (BPH).

Materials and Methods: We performed a clinical non-randomized controlled trial before and after 6-month treatment. Therapeutic Device was administered to 124 patients with BPH as mono-therapy. The dynamic of the patients' condition was assessed by the International Prostate Symptom Score (IPSS), ultrasound measurement of prostate volume (PV) and uroflowmetry. The control-group comprised 124 men who did not receive any treatment. The IPSS score, maximum flow rate (Qmax), and PV were compared between the groups.

Results: Baseline evaluation (pre-treatment) for both groups were comparable to each other with no clinically significant difference regarding age, IPSS score, Qmax and PV volume. Overall, thermobalancing therapy resulted in significant improvements from baseline to endpoint in IPSS ($P = .001$), IPSS storage and voiding subscores (both $P = .001$), and IPSS quality of life index (QoL) ($P = .001$) compared with control group. Moreover, comparison of parameters after 6 months treatment showed that thermobalancing therapy also improved the Qmax ($P = .001$), and PV ($P = .001$).

Conclusion: Two years clinical trial demonstrated that thermobalancing therapy administered for 6 months provides a marked improvement in patients presenting with symptomatic BPH not only on lower urinary tract symptoms (LUTS) but also in QoL and Qmax. Thus urologists should be aware about thermobalancing therapy as a non-invasive physiotherapeutic treatment option for treatment of BPH.

Keywords: case-control studies; humans; lower urinary tract symptoms; etiology; male; prostatic hyperplasia; treatment outcome; prospective studies; equipment design; quality of life.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a disease in which the prostate gland enlarges beyond the normal volume of 20-30 mL as part of the aging process, thus it is common among older men.^(1,2) BPH causes bladder outlet obstruction (BOO) among affected men and the several symptoms of BPH, which include lower urinary tract symptoms (LUTS), can adversely affect quality of life (QoL). BPH symptoms are classified as storage or voiding. Storage symptoms include urinary frequency, urgency, urgency incontinence, and voiding at night, named nocturia, which can lead to erectile dysfunction (ED).⁽³⁾ BPH is historically supposed to be a consequence of the ageing process and the abolition of the negative impact of an enlarged prostate in males should be done with the help of medical or surgical treatment. In the last decade, this view has been challenged. BPH-lower urinary tract symptoms (LUTS) should not be considered as an inevitable disease of older men but part of the ageing process which can be treated.⁽⁴⁾ In the last decade, the pathogenesis of

BPH began to consider from the perspective of vascular dysfunction,⁽³⁾ chronic ischemic tissue,⁽⁵⁾ and increased pressure in the prostate.⁽⁶⁾

Today, it is important to take into account the significant changes in the understanding of the etiology and pathogenesis of BPH. Recent developments suggest that BPH is of vascular origin. It has been shown that chronic ischemia results in thickening and fibrosis of the prostatic stroma, and impairs neurogenic relaxation in the prostate.⁽⁷⁾ Recent results demonstrate that ischemic prostate tissue in rats produces increased contractile response to electrical and pharmacological stimulation, increased smooth muscle α -actin (α -SMA), and increased collagen deposition.⁽⁸⁾

This view on the pathogenesis of BPH supports the hypothesis suggesting that the vascular system may play a role in the development of BPH.⁽⁹⁾ Measurements of resistive index (RI) and blood flow velocity using color Doppler ultrasound (CDUS) in control and BPH patients support the hypothesis that age-related deterioration of the blood supply to the urinary pathways has a

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role in the development of BPH, as arterial CDUS flow velocity was increased in the transition zone of patients with BPH.⁽¹⁰⁾

In a study by Zelli and colleagues, Doppler ultrasound was used to check the differences in the hemodynamic characteristics of prostatic artery in dogs in normal and BPH tissue and statistically significant differences were found in the study of the blood flow velocity in the arteries of the prostate gland in dogs in normal and BPH.⁽¹¹⁾

A literature review of preclinical and clinical studies in the etiology and pathogenesis of BPH show that, the vascular factor plays a decisive role, confirming that problems in the penis and the lower urinary tract accompanied by endothelial and neurological dysfunction that leads to hypoxia, vasoconstriction, contractility changes of smooth muscles, and damage to autonomic neurons and ganglia.⁽¹²⁾ In an experimental study that used a model of spontaneously hypertensive rats (SHR) was aimed to find out whether or not the unexpressed hypoxia in prostate is a possible mechanism that contributes to the development of BPH. SHR rats showed a significant increase in blood pressure and a significant decrease in blood flow in the prostate gland.⁽¹³⁾ Thus, development of prostatic hyperplasia may be associated with hypoxia in the prostate.⁽¹³⁾

According to the minutes of the European Association of Urology for the treatment of symptoms of LUTSs, many BPH patients do not express complaints about their conditions and therefore they are suitable for non-medication and non-surgical management, known as watchful waiting.⁽¹⁴⁾ Drug treatment or surgical procedures should be then offered only to men with severe LUTSs when conservative management options have been unsuccessful or are not appropriate. Transurethral resection of the prostate (TURP) and open prostatectomy are usually considered gold standard treatment options in these patients. The remarkable risk of mortality and morbidity of both procedures, especially TURP syndrome and bleeding, has prompted the search for minimally invasive techniques. Dr. Allen hypothesized that the cause of chronic diseases of internal organs, including BPH, is a violation of the microcirculation with the emergence of the focus of hypothermia, which is caused by increased pressure in the affected organ and the abnormal tissue growth. This theory is based on experimental studies that have shown that capillaries themselves are directly involved in the regulation of capillary recruitment and capillary blood flow distribution. The following possible hypothetical patterning rules are seen in all tissues of the body; "capillary network patterns in all tissues are determined by the same mechanisms",⁽¹⁵⁾ indicating that the growth of the tissue occurs at the micro-level when the tiniest blood vessels begin to spread.

It has been found that changes in the tissues under the influence of prolonged stress are characterized as hypoxia, ischemia, and micro-hypothermia, which under the electron microscope look like a lack of blood in a large area of tissue.⁽¹⁶⁾ It becomes a trigger for further growth of capillaries. The pressure in the tissue increases, which leads to new focuses of hypothermia, thus a vicious cycle is created. This factor Dr. Allen identified as pathological activity of capillaries leads to a problem in the prostate gland, its progressive growth, and chronic inflammation.⁽¹⁷⁾

In this study, we investigated the effect of thermobalancing therapy on BPH patients. Thermobalancing therapy via Therapeutic Device is directed to improve blood circulation in the prostate gland. The device keeps the thermoelement in the projection of the prostate, providing relief from the symptoms of enlarged prostate.

MATERIALS AND METHODS

Study Design

We used a clinical controlled trial before and after 6-month treatment. Enrolment began in April 2013. The Ethics Committee of the Yerevan State Medical University has approved the clinical study of Therapeutic Device. The effectiveness of thermobalancing therapy was studied by comparing men with BPH who received treatment with Therapeutic Device for 6-month with the control group.

Participants and Interventions

From April 2013 to April 2015, a total of 124 patients (age > 55 years) diagnosed with severe LUTS due to BPH (< 60 mL) who were naive for treatment recruited into this study. Initially a total of 226 men were examined and 124 patients selected for this clinical trial. Eighty men were excluded, as their prostate volume (PV) was over 60 mL or they had severe co-morbidities; 10 preferred operation; 4 were suspected prostate cancer; 8 did not attend to the following examinations. The patient selection was achieved in a multidisciplinary manner in conjunction with urologist.

Inclusion criteria were symptomatic LUTS due to BPH, International Prostate Symptom Score (IPSS) \geq 12, serum prostatic specific antigen (PSA) < 4 ng/mL, PV < 60 mL, and urinary peak flow rate (Qmax) < 15 mL/s. Exclusion criteria were history of any urogenital disease, malignancy or surgery, abnormal digital rectal examination (DRE), and co-morbidities, such as impaired renal function (serum creatinine > 2 mg/dL and diabetes mellitus). We included patients on anticoagulant medication or any coagulopathy.

Evaluations

The baseline evaluations included complete physical examination, medical history, DRE, serum biochemistry, and PSA measurements, electrolytes, urine and renal function tests. Evaluations were made at baseline and 6 months after the treatment. At the baseline assessment, patients were evaluated for PV (mL), IPSS, IPSS quality of life score (IPSS-QoL), and uroflowmetry (maximum urinary flow rate (Qmax, mL/s). IPSS-QoL scored as follow: delighted = 0, pleased = 1, mostly satisfied = 2, about equally satisfied and dissatisfied = 3, mostly dissatisfied = 4, hopeless = 5, and poor = 6. PV were measured at baseline and at 6 months after the treatment by ultrasonography (US-9000E2 ultrasound scanner, Rising Medical Equipment Co. Ltd, Beijing, China) and uroflowmetry was used for the measurement of the rate of urine flow parameters (Sanuro2UL, Santron Meditronic, Maharashtra, India). The standard ellipsoid formula length \times width \times height \times 0.52 was used to determine prostate volume.

Outcome Measures

Primary end points were the reduction of the IPSS and the increase of Qmax at 6-month after treatment. Secondary end points were the reduction of PV, PVR, and changes in QoL at 6 months after treatment.

Men in treatment group after the screening were given



Figure 1. The thermo element therapeutic device alone.

Therapeutic Device.

Dr Allen's Therapeutic Device

The Therapeutic Device is an elastic belt keeping a wax-based thermoelement mixture of waxes in the projection of the prostate (**Figures 1, A and B**). The thermoelement allows the body heat accumulation and acts as the heat source for the prostate. The neoprene belt keeps the thermoelement to the skin and avoids not allow heat dissipation (**Figure 2**).

The commercial production of Therapeutic device started in 2010 in England. In April 2010 the device was registered at the medicines and healthcare products regulatory agency (MHRA) as class 1 medical device. According to Independent authorized CE Marking representative in UK or EU, Class I Medical Device without a measuring function and supplied in non-sterile condition does not require the involvement of a Notified Body. In accordance with the 'Regulation of medical devices outside the European Union', Low-risk products may only require a supplier's declaration of conformity (SDOC), where the manufacturer is responsible



Figure 2. The thermo element therapeutic device on patient.

for ensuring that the product complies with the relevant requirement and then produces a written self-declaration statement.⁽¹⁸⁾ Qmax is a key indicator of impaired urination and was measured as previously described.⁽¹⁹⁾

Statistical Analysis

The study's quantitative variables are expressed as mean values, standard error, and minimum and maximum values, whereas the qualitative variables are expressed as numbers and percentages. For numerical data, independent sample t-tests were performed; for comparisons of before and after treatment, the non-parametric statistical hypothesis test by Wilcoxon was used. Statistical analysis was done by Statistical Package for the Social Science (SPSS Inc, Chicago, Illinois, USA) version 18.0.

RESULTS

Prostate Volume

Figure 3 shows the changes in PV (mL) in BPH patients at the beginning and at the end of the study. In the control group, the mean PV increased from 45.54 ± 5.569 to 50.85 ± 6.696 mL at the end of the study period, whereas in the treatment group the mean PV decreased from 45.19 ± 3.995 to 31.86 ± 4.158 mL ($P = .001$). For the control group, the z value was 8.727 with P value of .001. For the treatment group, the z value was 9.669 with a P value of .001. These data suggested that the therapeutic device reduced the PV significantly, whereas in control group the PV would increase.

Uroflowmetry Qmax

Figure 4 shows the results of the uroflowmetry Qmax (mL/s) in BPH patients. In the control group, the mean Qmax decreased from 7.95 ± 2.871 to 7.7 ± 2.695 mL/s, whereas in the treatment group the mean Qmax increased from 8.10 ± 3.041 to 17.73 ± 4.392 mL/s. For the control group, the z value was 1.929 and the P value .054 ($> .05$), indicating no statistically significant difference. For the treatment group, the z value is 9.621 at the significance level of .001, indicating a significant increase in the Qmax. Therefore, our results demonstrate that the therapeutic device increased the uroflowmetry Qmax significantly in BHP patients, whereas control group had no significant difference in the uroflowmetry Qmax.

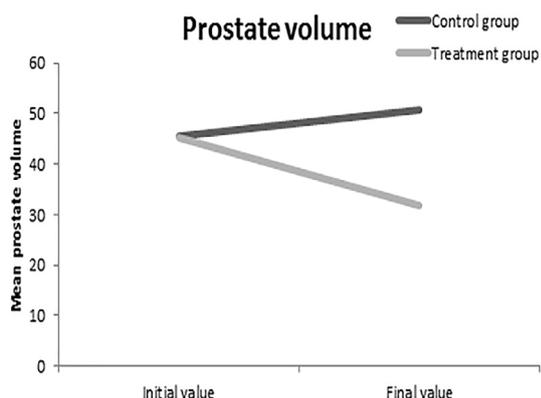


Figure 3. Prostate volumes (mL) in patients with benign prostate hyperplasia and control group at the beginning and at the end of the study.

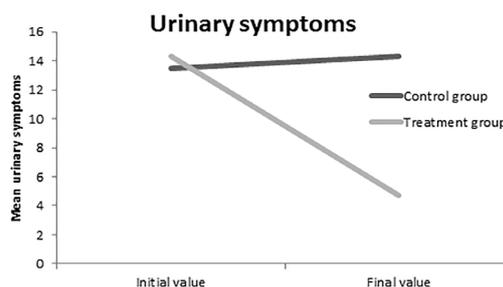


Figure 5. International Prostate Symptom Score (IPSS) in patients with benign prostate hyperplasia and control group at the beginning and at the end of the study.

Urinary Symptoms

We investigated the effect of the therapeutic Device on alleviating urinary symptoms, as assessed using the IPSS (Figure 5). In the control group, the mean IPSS increased from 13.45 ± 3.254 to 14.35 ± 3.396 , whereas in the treatment group the mean IPSS decreased from 14.33 ± 3.399 to 4.73 ± 2.754 at the end of the observation period. For the control group, the z value was 6.018 with a P value of .001. For the treatment group, the z value was 9.674 with a significance level .001. This indicates that the treatment with Therapeutic Device decreases the IPSS significantly, while in absence of treatment these would increase significantly.

Quality of Life

We assessed the QoL according to IPSS (Figure 6). In the control group, the mean QoL increases from 3.43 ± 0.956 to 3.76 ± 0.983 , whereas in the treatment group the mean QoL decreases from 3.91 ± 0.755 to 1.39 ± 1.110 . For the control group, the z value was 5.286 with a P value of .001. For the treatment group, the z value was 9.672 with a P value of .001. These results indicated that the treatment with Therapeutic Device decreased the QoL while this increased in the control group.

Safety

None of the patients who received thermobalancing

therapy had side effects.

DISCUSSION

In this study we investigated whether long-term use of thermobalancing therapy with Therapeutic Device could reduce BPH symptoms. Our result allows us to concluded that the treatment reduces the PV significantly, increases the uroflowmetry Qmax significantly, decreases IPSS and that improves the QoL significantly. These indicate that the thermobalancing is effective in the treatment of BPH.

Clinical improvement and positive changes in the ultrasound and uroflowmetry parameters in men with BPH who used Therapeutic Device could be explained by positive changes in the prostate. This is due to the natural thermoelement, which was tightly attached to the body in the projection of the prostate gland, and maintaining the accumulated temperature for a long period. We believe that the use of therapeutic device by keeping the temperature in the projection of the prostate gland acts on micro-focus of hypothermia and ischemia in it, removing the vicious cycle of spontaneous growth of capillaries in response to a trigger, micro-hypothermia, thereby relieving the BPH symptoms.

Thermobalancing therapy provides an alternative to classical BPH surgical treatments. Studies show that

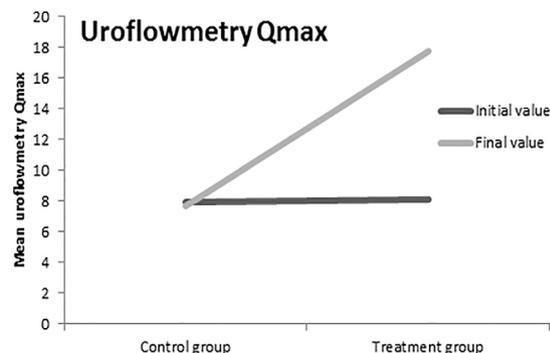


Figure 4. Maximum urinary flow rate (Qmax) (mL/s) in patients with benign prostate hyperplasia and control group at the beginning and at the end of the study.

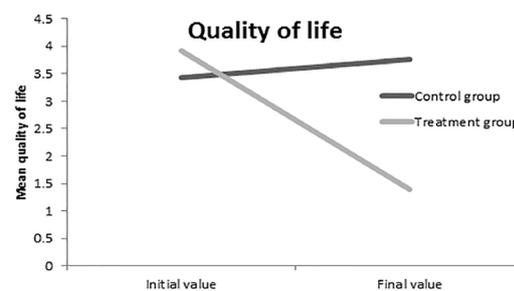


Figure 6. International Prostate Symptom Score Quality of Life (IPSS-QoL) domain in patients with benign prostate hyperplasia and control group at the beginning and at the end of the study.

moderate to severe symptoms of LUTS significantly affects the QoL of patients and that half (52.8%) of men with BPH are dissatisfied with the results of medical treatment administered, according to current international guidelines for BPH.⁽²⁰⁾ In addition, most commonly used BPH medications have side effects, especially in the long-term use.⁽²¹⁾

Surgical treatment of prostate may also be accompanied by new challenges. Thus, the results of a survey of sexually active men after three different laser surgeries from 2005 to 2010 concluded that these surgical techniques can have a negative impact on sexual function, and patients with normal preoperative sexuality are more at risk.⁽²²⁾ Therefore, thermobalancing therapy could be an apt solution for BPH treatment in these cases.

CONCLUSIONS

The results of this study demonstrate improvement in men with BPH after treatment with Therapeutic Device. We observed positive effects in the IPSS symptom score, PV, and uroflowmetry parameters. More studies with thermobalancing therapy for BPH are needed to draw final conclusion.

CONFLICT OF INTEREST

The first author of this manuscript is the manufacturer of the device. This study was funded by Fine Treatment, United Kingdom and Institute of Surgery Mikaelyan, Republic of Armenia.

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