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Effect of Electromagnetic Field Therapy versus Exercise Training in Elderly with Prostatic Dysfunction: A Mini-Review

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ABSTRACT
Background: The benign prostatic hyperplasia develops gradually with age and is characterized by an increase in prostate cell proliferation. Clinical manifestations of benign prostatic hyperplasia (BPH) include symptoms with the lower urinary system. Prostate cancer and BPH are not causally related. The implications of nocturia and bladder dysfunction, especially on quality of life, are significant in cases of clinically evident BPH.
Purpose: The aim of this review was to investigate and compare the effects of electromagnetic field (EMF) therapy and aerobic exercise on prostatic function in elderly males with benign prostatic hyperplasia (BPH).
Conclusion: Both electromagnetic field therapy and aerobic exercise were effective in enhancing symptoms and quality of life in elderly men with BPH. However, EMF therapy alone demonstrated superior outcomes in reducing urinary symptoms and enhancing quality of life compared to aerobic exercise and medical treatment alone.
Keywords: Aerobic Exercise, Electromagnetic Field Therapy, Lower Urinary Tract Symptoms, Prostatic Enlargement, Quality of Life.

INTRODUCTION

Benign prostatic hyperplasia (BPH) is characterized by an enlarged prostate volume (PV) caused by the not malignant growth of cells in the gland's parenchyma as well as stroma, particularly in the transition area. Lower urinary tract symptoms (LUTS) are frequent symptoms of benign prostatic hyperplasia (BPH), an age-related condition that impairs patients' quality of life [(1)].

Benign prostatic hyperplasia (BPH) is a condition in which the prostate gland grows larger than normal, but the growth is not caused by cancer. There are two main stages of growth in the prostate. During the first stage of puberty, the prostate experiences a doubling of its size. Around the age of 25 begins the second growth phase, which lasts throughout the life. BPH often manifests towards the end of the second growth phase. Between 29% and 33% of men aged 65 and up and 5% to 6% of men aged 40 to 64 are considered to suffer from BPH, according to experts. The most prevalent prostate disease affecting males over 50 is BPH. In males under the age of 40, BPH symptoms almost never manifest [(2)].

Age is a significant predictor of the development of BPH and subsequent LUTS. **Platz *et al.*** [(3)] found that the connection among BPH and the development of LUTS grows linearly with age, and that 50% of men over the age of 50 show signs of BPH. This is corroborated by research showing that the prostate grows larger with age, with a 2% to 2.5% rise in size annually [(4)].

The prevalence of BPH is over 80% in men aged 70 and more, and as high as 70% in men aged 60–69 in the United States, according to study. From 8% in the 30–39 age group to 35% in the 60–69 age group, the prevalence of male LUTS rose significantly in a community health survey conducted in the Boston area. Among males aged 50–79, 56% reported symptoms of BPH in other US population-based research [(5)].

Benign prostatic hyperplasia (BPH) causes a variety of symptoms related to the urinary system and is more prevalent in elderly men. Notable symptoms involve an increase in urine frequency, particularly throughout the night (nocturia), a sense of urgency, trouble beginning to urinate, a weak or interrupted urine stream, and a feeling that the bladder is not completely emptying. In more serious instances, there's a chance of urinary tract infections (UTIs), which can cause pain or discomfort due to urine retention. These symptoms arise due to the enlargement of the prostate, which compresses the urethra, obstructing the flow of urine. The degree of symptoms can vary based on the severity of the obstruction and the size of the prostate [(6)].

The development of lower urinary tract symptoms (LUTS) and bladder outlet obstruction in men with BPH can be attributable to static and dynamic components. The periurethral compression and blockage of the bladder outlet that occur as a direct consequence of an enlarged prostate is known as static obstruction. An obstruction in urine flow can be caused by an enlarged prostate or by periurethral compression, both of which necessitate higher voiding pressures for overcoming flow resistance [(7)].

When the prostate enlarges intravesically, the pressure from the detrusor muscle tends to close the bladder outlet, making it even more difficult to urinate. The bladder outlet can be closed during voiding due to a flap or "ball-valve" effect caused by unequal median lobe enlargement; this greatly restricts flow and causes the bladder to not empty completely. Prostate smooth muscle tension is one of the dynamic components; this is why alpha-blockers and five alpha-reductase inhibitors are used to decrease prostate volume and relax the smooth muscle, respectively. This is because men with benign prostatic hyperplasia have less collagen and flexibility in their prostatic urethra, which makes the

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symptoms of bladder outlet obstruction worse by reducing compliance and increasing flow resistance [8].

An enlarged prostate, known medically as BPH, is a typical symptom among men in their elder years. Histologically, BPH is characterized by hyperplasia of both the glandular and stromal elements of the prostate. The condition primarily affects the transitional zone, that surrounds the urethra, leading to compression of the urethra and symptoms such as urinary retention and frequency. Glandular hyperplasia manifests as an increased number of epithelial cells within the prostate acini, while stromal hyperplasia involves the proliferation of smooth muscle and fibrous tissue. Over time, the prostate enlarges, and the surrounding stroma becomes more fibrotic. These changes result in a combination of enlarged prostate glands and increased stromal density, both contributing to the clinical manifestations of BPH, such as difficulty urinating and reduced urinary flow [9].

Prostate cell and stroma aberrant proliferation occurs as a result of the production of mitogen substances (cytokines, growth factors) throughout inflammation [10]. The trigger for future fibrosis and tissue hypoxia leading to structural alterations in the prostate [11].

If metabolic syndrome is associated with the onset of BPH/LUTS, then lifestyle changes including reduced caloric intake, increased physical activity, and improved dietary habits would benefit patients in terms of both symptom management and the rate of disease progression. Both the symptoms as well as the root causes should be addressed in management strategies for LUTS/BPH and metabolic syndrome. This is due to the fact that men with metabolic syndrome respond more negatively than those without the syndrome, and it is also possible that a change in lifestyle, including a healthier diet and more exercise, will be sufficient to alleviate the symptoms [12].

One of the main functions of alpha-blockers is to reduce the tone of the smooth muscles in the prostate and the neck of the bladder. By relaxing the stromal smooth muscles, blocking alpha 1-adrenoreceptors alleviates the dynamic aspect of BPH, thus improving flow and urinary symptoms. Typical improvement in International Prostate Symptom Score (IPSS) and AUA symptoms scores is 4 to 6 points. Among these are selective alpha-blockers made especially for the prostate, like silodosin (4–8 mg once daily), alfuzosin (10 mg once daily), and tamsulosin (0.4–0.8 mg once daily). Within 72 hours, they have the most powerful effect. Use of these drugs should be approached with caution in patients undergoing glaucoma or cataract surgery, as they are linked to floppy iris syndrome. Such circumstances should be discussed using the patient's ophthalmologist. In addition to low blood pressure, dizziness, as well as ejaculatory problems are common side effects of alpha-blocker medication. Although the majority of individuals with severe sulfa allergies are able to use tamsulosin, they may infrequently experience an adverse reaction. Neither the long-term risk of acute urine retention nor the eventual necessity for surgical BPH management seem to be affected by alpha-blocker medication, in contrast to five alpha-reductase inhibitors [13].

Other alpha-blockers, such as terazosin and doxazosin, are equally effective in relieving prostatic issues but are much more likely to cause generalized side effects such as orthostatic hypotension [14].

Search strategy:

The goal of the search is to find literature comparing two non-pharmacological interventions (Electromagnetic Field Therapy and Aerobic Exercise) for benign prostatic hyperplasia (BPH) in elderly males. To ensure comprehensive coverage, the search would be performed across multiple biomedical and scientific databases, PubMed/MEDLINE: For core clinical medical literature**.** Web of Science**:** For high-impact journal coverage and citation tracking. PEDro**:** For evidence in physiotherapy interventions, and the key words to search were **"**Benign Prostatic Hyperplasia" "Lower Urinary Tract Symptoms" "Pulsed Electromagnetic Field Therapy" "Aerobic Exercise" "Prostate Enlargement", and "Quality of life".

DISCUSSION

Presently, there is no cure for benign prostatic hyperplasia (BPH) that has 100% success rate. Both surgical and pharmaceutical treatments are available, and they both have their advantages and disadvantages. For males having symptoms of BPH, the treatment of choice has always been transurethral prostate resection (TURP). The need for TURP is decreasing, nevertheless, because less invasive procedures are being created as the morbidity rate of the procedure approaches 20%. Both alpha-blockers as well as 5 alpha-reductase inhibitors can be used as pharmacological treatments for BPH. While these drugs can increase urine output, they do not significantly decrease the prostate size and may cause undesirable side effects including erectile dysfunction or low blood pressure [15].

Pulsed electromagnetic field therapy (PEMF) was considered as a potential novel treatment for BPH based on the results of previous studies. The following key ideas are emphasized: (1) hyperplastic changes in the prostate can be triggered by inflammation, and (2) the prostatic vascular system is crucial for growth as well as regulation of the prostate. A disruption in blood flow to the gland may play a role in the development and control of BPH [16].

The utilization of time-varying magnetic fields, typically produced at low frequencies using an alternating current flowing through a coil, is the basis of electromagnetic therapies. In order to treat problems that have not responded to other treatments, particularly in the musculoskeletal system, clinicians and researchers have taken a scientifically rigorous approach to clinically applying PEMF. PEMF offers a realistic, non-invasive way to induce cell and tissue change that can cure some

disease disorders, and it is well acknowledged that PEMF is safe for use in therapeutic settings. A great range of biological processes may be significantly impacted by external electromagnetic fields, according to numerous papers [(17)]. There are benefits to using a pulsed electromagnetic field on the blood flow and blood vessels in the prostate and other organs. Therefore, it may be possible to treat or avoid BPH in patients by lowering inflammation and increasing oxygen delivery to tissues, which reduces tissue hypoxia caused by abnormal blood flow patterns [(18)].

Regular physical exercise has been shown to positively influence BPH, a frequent condition in aging men described by prostate enlargement and LUTS. The mechanisms by which exercise may improve BPH include hormonal modulation as exercise reduces insulin-like growth factor-1 (IGF-1) as well as estrogen levels, both of which are linked to prostate growth, while increasing testosterone metabolism, potentially slowing BPH progression [(19)].

Physical activity (PA) has myriad health benefits, which may also extend to protection against BPH and LUTS development and progression. According to **Sauver *et al.*** [(20)], PA may protect against BPH/LUTS in a number of ways, such as by lowering body size and minimizing activity in the sympathetic nervous system.

The association among physical activity and BPH has not been well studied. While early research from the Health Professionals Follow-up study first identified an inverse association showing that men who walked ≥3 hours/week had a 10% lower BPH risk, moderate aerobic exercise (e.g., brisk walking 30–60 minutes/day) significantly reduces LUTS severity in BPH patients [(21)].

Research has shown that men with BPH who engage in physical activities are less likely to experience the negative effects of being sedentary and obesity [(22)].

Monitoring the effect of physiotherapy interventions on BPH, diaphragmatic breathing exercises may be an alternative to exercises for the treatment of urinary incontinence (UI) and BPH [(23)].

Human observational reviews support that higher levels of physical activity—including aerobic modalities—are associated with lower odds of BPH and LUTS. A systematic review as well as meta-analysis of observational studies (43,000+ men) found that compared to sedentary lifestyle, moderate to vigorous physical activity was linked to a significantly reduced risk of BPH/LUTS. While randomized controlled evidence remains limited and rated as very low certainty, some small trials (including tai-chi and pelvic floor training) demonstrated improvements in symptom scores (e.g. IPSS reduction by ~6–8 points) when compared to waiting or conventional treatment. Together, these findings suggest that regular aerobic exercise may reduce urinary frequency, nocturia, urgency, and weak urinary stream associated with BPH, possibly via metabolic and anti-inflammatory mechanisms [(24)].

CONCLUSION

This review demonstrated that PEMF therapy was an effective and non-invasive intervention for improving prostate volume, PSA levels, LUTS, and quality of life in elderly men with BPH. While aerobic exercise and medical therapy also provided benefits, PEMF therapy appears to offer superior symptom relief and overall improvement in patient well-being.

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