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Pelvic floor muscle training for conservative treatment of urinary incontinence and erectile dysfunction after radical prostatectomy: a review of literature

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Abstract

Both, urinary incontinence (UI) and erectile dysfunction (ED) reduce person's quality of life. Current research shows, that pelvic floor muscle training (PFMT) might lessen pelvic dysfunction symptoms.

Aim: To present the current epidemiology of pelvic floor muscle dysfunction in radical prostatectomy (RP) patients and examine the current literature concerning PFMT in alleviating UI and ED in RP patients.

Materials and methods: Cochrane, Google Scholar and PubMed were searched for articles using the terms "pelvic floor dysfunction", "urinary incontinence", "erectile dysfunction" in combination with "prevalence", "epidemiology", "statistics", "burden" and "pelvic floor muscle training" „conservative treatment“ in combination with "radical prostatectomy", "erectile dysfunction", "urinary incontinence", "pelvic floor dysfunction" and included studies from 2010 to February of 2022. Only full text articles were included. Paediatric studies were excluded.

Results: The prevalence of UI among patients who underwent RP varies from 2 to 66%. The prevalence of ED ranges from 10 to 46 % 12 months post RP. Pelvic floor rehabilitation after radical prostatectomy is recommended by the European Association of Urology as a method for UI management for patients after RP. Supervised, high-volume and biofeedback incorporating PFMT seems to be useful in reducing post prostatectomy UI. PFMT is also showed to be beneficial for the treatment of ED.

Conclusions: UI and ED after RP are common. Research on the effectiveness of PFMT for UI and ED raises hope, however, data is highly inconsistent due to methodological disparities.

Keywords: radical prostatectomy, pelvic floor dysfunction, urinary incontinence, erectile dysfunction, pelvic floor muscle training.

Introduction

Ever since A.H Kegel has published his work on pelvic floor exercises for women in 1948 there has been a rise in research, concerning the benefits of pelvic floor exercises for women (1). However, pelvic floor exercises historically have been as important to men as they are to women during modern times. The muscles which comprise the pelvic floor can be divided into three layers. The superficial layer is comprised of bulbospongiosus, ischiocavernosus, superficial transverse perineal and external anal sphincter. This layer is important for healthy ejaculation and urinary and faecal continence. The second layer is mostly responsible for ensuring stress continence (eg. when coughing and sneezing) and is comprised of deep transverse perineals, the sphincter urethrae and the compressor urethrae. The third and the deepest layer is the pelvic diaphragm. It is made up of pubococcygeus, puborectalis, pubourethralis, iliococcygeus and ischiococcygeus (2). The correct form and execution of pelvic floor exercises are voluntary contractions of the pelvic floor muscles, that allows the general upwards lift of all muscles and contraction of sphincters, which in turn stops the urine stream or passing of gas (3). Hippocrates and Galen spoke of pelvic exercises performed in bathhouses, there are records of “deer exercises” specifically catered to men, to preserve their vitality and health from 6000 years ago in ancient China (4). The burden of urinary incontinence (UI) and erectile dysfunction (ED) post radical prostatectomy (RP) is significant and often unavoidable (5). Because of greatly successful utilization of pelvic floor muscle training (PFMT)

for UI in female populations, pelvic floor physiotherapy has received a lot of attention from physicians and researchers as a possible treatment for UI and ED in patients post RP.

Materials and methods

The searches in Cochrane, Google Scholar and PubMed have been conducted. The searches were performed using the terms “pelvic floor dysfunction”, “urinary incontinence”, “erectile dysfunction”, “” in combination with “prevalence”, “epidemiology”, “statistics”, “burden” and “pelvic floor muscle training” „conservative treatment“ in combination with “radical prostatectomy”, “erectile dysfunction”, “urinary incontinence”, “pelvic floor dysfunction” and included studies from 2010 to the February of 2022. The articles were included in the review if they were written in English, if full text version was available and if they were published in peer-reviewed journals. Paediatric studies were excluded. There were 37 articles identified in our search and included in our review.

Results

After literature search 53 papers were selected to acquire and conduct full text review, out of those 53 papers 29 met inclusion criteria and were included in this article. Conducted review allowed to determine the most common types of pelvic floor physiotherapy for men, currently used in clinical practice to treat UI and ED: PFMT, PFMT guided by a physiotherapist, PFMT with biofeedback, PFMT with transcutaneous electrostimulation, extracorporeal magnetic innervation.

1. PFMT is considered to be the most basic form of pelvic floor physiotherapy and is

described as voluntary pelvic floor muscle contraction that causes an upward lift of pelvic floor muscles and contraction of anal and urethral sphincters, which causes stop of urine stream and/or passage of gas/faeces (3).

2. PFMT guided by a physiotherapist is a PFMT regimen that is taught and supervised by a professional. This can be achieved by introducing regular check-ups in an outpatient clinic or a physiotherapist office during which a digital examination could be performed to assess the strength and technique of pelvic floor exercises. These visits can be scheduled in many ways, meaning weekly, biweekly or monthly schedule and can be held more or less often, depending on individual results (6).
3. PFMT with biofeedback is more popular among women, than men. However, there are biofeedback devices who are made specifically for men. Usually, such devices are made to be safely inserted inside the body, to measure the strength of muscle contractions, while performing the exercises they can be connected to an app on a person's phone, where an algorithm measures the efficacy of exercises, gives tips on how to improve, shows results from usage over time. It is important to note, that there are biofeedback devices for men who are made to be sat on and do not require insertion (7).
4. PFMT with transcutaneous electrostimulation is different from

methods mentioned earlier because it is a primarily passive way to train pelvic floor muscles. This means, that a person who is undergoing such treatment will contract muscles involuntarily. This type of PFMT is beneficial for patients who have very weak pelvic floor muscles and are incapable of inducing effective voluntary contractions (8).

5. Extra-corporeal magnetic innervation is a passive method and is applied by using a magnetic chair to surround pelvic floor muscles in a magnetic field, which in turn should induce involuntary muscle contractions, much like electrostimulation this method is most used for patients who are incapable of inducing effective voluntary contractions (8).

Usually these training methods are performed sitting or lying, however there are some studies that offer to train while standing up (6). All of the mentioned methods aim to train all of the pelvic floor muscles, which are: bulbospongiosus, ischiocavernosus, superficial transverse perineal and external anal sphincter, deep transverse perineal, the sphincter urethrae and the compressor urethrae, pubococcygeus, puborectalis, pubourethralis, iliococcygeus and ischiococcygeus (2).

The epidemiology of pelvic floor dysfunction

The male population does not undergo pregnancy and birth, has a different pelvic anatomy, thus the prevalence rate of UI is much lower: for example UI prevalence among the general population is estimated to be about 8 %, however among women it is 25-45% (9,10). Usually, pelvic floor

dysfunction prevalence in male population increases with age or in case of pelvic cancers, such as prostate cancer (11). UI and ED are two most common complications of RP (12). One cross sectional survey that looked at the prevalence of pelvic floor dysfunction among men and women aged 15-95 years old revealed that 4,4% of men experienced UI (13). The prevalence of UI after nerve sparing prostatectomy is around 1%, however this number increases steeply among patients who underwent RP and varies from 2 to 66% (14). Globally ED prevalence is from 3 to 77% and is closely associated with increasing age and cardiovascular diseases (15). Among patients who underwent RP surgery ED increases significantly compared to general male population and ranges from 10 to 46 % 12 months post RP (5). Some researchers assume that disparities in prevalence of UI and ED after RP might be related to such factors as: type of RP performed (for example robotic versus open RP or laparoscopic versus open RP), stage of prostate cancer at diagnosis. However, a prospective trial conducted in 2015 found that UI and ED was almost equally prevalent in the group that was treated with open RP and the robot-assisted laparoscopic RP (RALP) (16). For example, in the 2015 trial 12 months after surgery UI was found in 21,3% of men who were treated with RALP and 20,2% among those who underwent open RP, meanwhile ED was present in 70,4% of those who underwent RALP and in 74,7% of open RP patients (16). Another prospective observational study from the European Prostate Centre Innsbruck found that RP significantly increases the risk of UI and ED as they found that UI rates increased from 18.8%

preoperatively to 63% 12 months post RP and a similar trend was observed in ED prevalence as it increased from 39,6% to 80,1% postoperatively (17). A large 2021 systemic review and metanalysis found that larger prostate volume, older age and shorter membranous urethra length were prognostic factors of urinary incontinence 12 months postoperatively (18). For example: every 1 mm increase of the membranous urethra length reduces the chance of postoperative UI by 17%, every 5 year increase in age adds a 15% increase of UI risk and every 10 ml increase in prostate volume adds 5% of risk for UI up to 3 months after surgery and 4% for every 10 ml 3-12 months after surgery (18). However, currently there is insufficient data to claim, that prostate cancer stage and biopsy Gleason score has any role in predicting UI prevalence in post RP patients (18). Concerning ED prevalence after RP, currently there are no standardised prediction tools routinely used in clinical practice, however a 2017 systematic review found two accurate (>70% accuracy) prediction tools, that could be generalised and used in clinical practice (14). These tools used patient dependent variables such as age, race, estimated prostate volume, Gleason score, body mass index and more to calculate patient outcome after RP (14).

Pelvic floor muscle training for urinary incontinence

Pelvic floor rehabilitation after radical prostatectomy is recommended by the European Association of Urology as a method for UI management for patients after RP (19). There are a

lot of contradicting studies concerning the efficacy of PFMT for treatment of UI after prostatectomy. Some found significant effect of physiotherapy on physical and quality of life parameters (7,12,20–22). Others stated that the results of PFMT for UI treatment after RP are inconclusive (8,23–25). Among articles that found a positive effect of PFMT for UI post RP one study found, that at 3 months post RP from the control group 23,3% were continent and from the comparison group 34,9% were continent (22). Another randomized trial found, that the number of continent individuals increased more than 5 times from 2 weeks after RP to 12 weeks after RP (14% to 74% respectively) in the intervention group, while the increase in the control group was from 4% to 43% (21). A systemic review and meta-analysis conducted in 2018 found 5 studies of moderate GRADE quality that revealed a significant increase of continent men in the PFMT intervention group, than in the control group, the same meta-analysis found no statistical difference between PFMT with biofeedback intervention group and PFMT only control group (7).

The most recent 2015 Cochrane review for conservative management of UI after RP found that there was no evidence that PFMT with biofeedback or PFMT is more beneficial for UI treatment after RP than simply waiting 12 months after surgery (8). Electrostimulation and extracorporeal magnetic innervation were found to be beneficial, as the number of incontinent men was lower than in control groups 12 months after surgery (8). Researchers have found, that the main reason for heterogeneity in the reported efficacy for management of urinary dysfunction in men could

be the variations between the design of pelvic floor muscle training programs in different trials: most programs had different repetition times, had insufficient descriptions of the exercises or they were not provided at all (6). For example out of 115 studies who were investigated in the 2018 systematic review: 63 did not specify whether patients were educated on pelvic floor anatomy (meaning they knew which muscles needed to be contracted and which not) before the start of physiotherapy, 78 studies did not specify the duration of PFMT sessions (6). Most trials recommended participants to perform 3 training sessions a day, each session had to include 9-15 repetitions, however overall daily contractions differed greatly between trials and ranged from 18 to 240 (6). Another reason in heterogeneity of results could be a varying definition of UI among researchers as some define UI relying on quality of life questionnaires done by the patient, while others use the “no pad” definition, meaning that a person is continent only if they require no pads to live their daily life (18). Furthermore, a 2020 meta-analysis found study design features, that should be generalised in all future studies investigating UI after RP in order to reduce disparity between results in different trials (26). In the 2020 meta-analysis usage of biofeedback, instruction to contract around the urethra, a control group with no prior education on PFMT, inclusion of all men despite continence status and continence defined as no leakage were found to be study design features important for 3 month study result outcomes (26). This is further supported in a 2021 meta-analysis, which showed, that supervised, high-volume (with higher number of repetitions) and biofeedback

incorporating pelvic floor muscle exercises are the most beneficial in reducing post prostatectomy UI (27).

Pelvic floor muscle training for erectile dysfunction

The neurovascular bundle containing the erectile nerve is right by the anterolateral side of the prostate, because of the anatomical location of the bundle it is difficult not to damage it during radical prostatectomy (5). Some researchers claim, that evaluating the effect of physiotherapy in treating ED in patients after RP is difficult because a lot of patients in these studies also have UI, which can severely affect sexual relationships and sexual satisfaction (25). Some studies find that improvement of erectile dysfunction is closely related to urinary continence, going as far as to say, that urinary continent males after RP have a 5.4 times higher chance of being potent (28). A possible reason for impaired sex life could be climacturia associated incontinence which is more common in patients after RP and can occur from 22 to 49% of cases (29). One study found that PFMT with electrical stimulation did not provide better results than in the control group, both PFMT with electrical stimulation group and no intervention group recovered with no significant difference: muscle strength and urinary continence returned at the same rate (25).

In the *Laurienzo et al.* study patients were randomly assigned to three groups (patient variables: age, body mass index, severity of ED were accounted for and groups were homogenous): first group was control and received no education on postoperative PFMT, second group was instructed to perform PFMT exercises 2-3 times a

day for 6 months, third group performed PFMT exercises and additionally received electrostimulation therapy two times a week for 7 weeks (14 sessions in total) (25). At 6 months post RP all three patient groups were examined, no statistically significant difference in pelvic muscle strength, continence or erectile function was found (25).

In the *Geraerts et al.* study, which examined the effectiveness of PFMT for the treatment of ED one year after RP, the treatment group achieved better results than the control group, but the ability to orgasm did not differ between the two groups (29). In this study patients could not use any other aids to support erectile function and received individual physician supported PFMT together with electrostimulation and performed an at home program that consisted of 2 sessions of exercises, 30 repetitions each (29). At the end of 15 month treatment, 12/30 patients were able to have penetrative sexual intercourse, whereas before the treatment 5/30 could have sexual intercourse (29).

Conclusions

Urinary incontinence and erectile dysfunction are common complications of radical prostatectomy that greatly impair the quality of life of the patients affected. The data on the effectiveness of current conservative treatment options is inconsistent as the disparity between different trials studying the efficacy of these exercises is too great. Supervised, high-volume and biofeedback incorporating pelvic floor muscle exercises have been found to be the most beneficial in reducing post prostatectomy urinary incontinence. Despite improvement of erectile properties, pelvic physiotherapy has no effect on the ability to orgasm.

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