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Is (p)rehabilitation effective for men undergoing prostatectomy?

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Abstract
Prostate cancer is the most common cancer in men, and 4500 radical retropubic prostatectomies (RRPs) are performed in the UK every year. The most common symptoms after surgery are urinary incontinence and erectile dysfunction. Prehabilitation promotes the strengthening of the pelvic floor in the absence of pain or incontinence. Pelvic health physiotherapists are assisting in prehabilitation and rehabilitation by teaching pelvic floor muscle exercises to men undergoing RRP. Thorough assessment prior to surgery is essential because this helps to guide postoperative prognosis. The research into whether (p)rehabilitation is effective for reducing these symptoms in the postoperative period is mixed; however, the best outcomes occur with a combination of both, with a bias towards prehabilitation. Ensuring that follow-up with the patient continues until continence is achieved, along with return to sport, is important because men undergoing surgery have a desire to return to a higher level of function.

Keywords: pelvic floor muscle exercises, prehabilitation, prostatectomy, rehabilitation.

Introduction

Prostate cancer is the most prevalent form of this disease in the male population. In the UK, over 47 000 men are diagnosed with prostate cancer every year (CRUK 2019), i.e. one in eight members of this population. It is more prevalent in black males, affecting one in four men of African descent. Over 330 000 men are living with prostate cancer in the UK, and 4500 radical retropubic prostatectomies (RRPs) are performed every year. The incidence of stress urinary incontinence (SUI) following an RRP is 87%, and the incidence of erectile dysfunction (ED) is 100% 1 month after the operation (CRUK 2017; PCUK 2017). Based on the National Institute for Health and Clinical Excellence (NICE, now the National Institute for Health and Care Excellence) guidelines (NICE 2019), men who have undergone prostate surgery should be offered specialist assessment and treatment to help them cope with these challenging symptoms.

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Surgery

Radical retropubic prostatectomy is the most common form of surgery currently carried out. Some hospitals employ robotically assisted surgery, also known as the da Vinci Surgical System (Intuitive Surgical Inc., Sunnyvale, CA, USA). The benefits of robot-assisted surgery are: less bleeding; less scarring; a shorter hospital stay; and a quicker recovery. However, there is currently no difference between open and robot-assisted surgery in terms of incontinence and ED outcomes. The outcome is based on the surgeon's experience and the location of the cancer. During surgery, the prostate and seminal vesicles are removed, as shown in Figure 1 (CRUK 2016).

Signs and symptoms

Urinary incontinence is the most commonly reported symptom after a prostatectomy, and it is often the most bothersome one for patients. It occurs as a result of internal urethral sphincter deficiency, and injury sustained during surgery. Immediately after the operation, a catheter will be placed *in situ* for approximately 2 weeks to

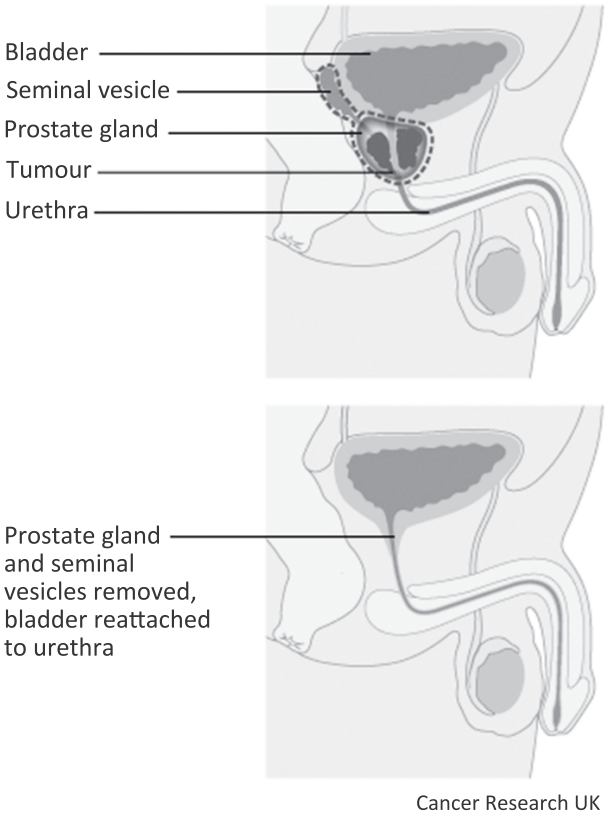

Figure 1. Before surgery versus after, showing removal of the prostate and seminal vesicles (CRUK 2016; © Cancer Research UK, used with permission).

allow the anastomosis to heal. The catheter will be removed in an outpatient setting. Following extraction, urine flow will be constant for the majority of men, and has been described as "a tap you cannot turn off". At this time, patients will be completely dependent on pads, which, for many men, will be a brand-new experience and often quite daunting. Urinary retention sometimes occurs, but this is less common. Men may also report an impaired bladder-filling sensation because of the constant leakage. Detrusor overactivity can occur preoperatively, if there is an enlarged prostate restricting the urethra. This requires the detrusor to work harder to evacuate urine from the bladder, and can lead to symptoms of urgency and frequency postoperatively.

Erectile dysfunction is another very common side effect following a prostatectomy. Even if they have had nerve-sparing surgery, men will almost certainly report an absence of spontaneous erections, both nocturnally and upon awakening. The cause of this is usually neurogenic in origin, especially after non-nerve-sparing surgeries in which, because of the location of the tumour, the surgeon has been unable to preserve the cavernous nerves. A medical illustration in Tewari *et al.* (2012, p.14; www.nature.com/articles/ijir201140/figures/2) shows the complexity of the nerve and vascular bundles surrounding the prostate that surgeons have to navigate around. As the reader can imagine, even in nerve-sparing surgeries there is a high chance of arterial trauma, which can lead to hypoxia to the smooth muscle of the corpora cavernosa in the penis.

As a result of nerve damage, any potential recovery of erectile function can take up to 2 years. The length of recovery is dependent on the preservation of vascular and nerve bundles from the surgery. Many studies have described the importance of promoting oxygenation to the corpora cavernosa. The lack of natural daily erections can cause atrophy and fibrosis of the smooth muscle of the corpora cavernosa, and thus, lead to penile shortening. There is more evidence to suggest that the early introduction of penile rehabilitation can prevent this irreversible structural damage from occurring. There are four main modalities of treatment to improve erectile function: phosphodiesterase inhibitors (e.g. PDEI-5); intracorporeal injections; vacuum devices; and transurethral prostaglandin injections. For the purpose of the present article, the authors will only highlight the use of vacuum devices in the section on postoperative rehabilitation below. Another factor that men need to be made aware of is that, with the prostate removed, they will no longer produce semen. They will be able to have an orgasm, but no ejaculate will be produced.

Prehabilitation

Assessment

The aim of the initial preoperative physiotherapy assessment is to obtain a clear picture of the patient's symptoms at baseline. These symptoms will determine the prognosis for recovery. Figure 2 shows the first page of the assessment form that the present authors use in their clinic, which covers the subjective assessment. The key information to gather is whether the patient currently has any stress or urge urinary incontinence, and/or urinary frequency. It is also essential to ask about urine flow because, if this is poor as a result of an enlarged prostate, it could mean that there is hypertrophy of the detrusor muscle. This makes postoperative leaking more likely, and if it does occur, more prolonged.

Baseline erectile function is also key when considering other factors that might be contributing to any dysfunction (e.g. vascular problems). It is important to establish whether the patient's partner is male or female, if the couple

SIX Physio MENS HEALTH Assessment Form

Name ……D.O.B……..

Referrer:	Next Clinic Appt/Review:

PC: Duration of Problem: .
Consent: Y / N

HPC:……
……
……
……
……
……
……

Bladder Function:			
Stress IC Aggs:		**Urge IC** Aggs:	
Frequency	Daily >1/week <1/week > 1/month	Frequency	Daily >1/week <1/week >1/month
Severity	Few drops Wets underwear Wets outerwear Runs down legs Complete loss	Severity	Few drops Wets underwear Wets outerwear Runs down legs Complete loss
Urgency		Aware of leakage?	
Deferment time		Continuous UI	
Voids 'just in case'		Stream (speed/volume)	
Frequency		Haematuria?	
Nocturia		Stop Test?	
Nocturnal Enuresis		**Pad use**	
Disuria (Pain)		Type/size:	
Hesitation		No per day/night:	
Straining		Family Hx	
Incompl. emptying		Childhood Prob	
Post mict. dribble			

Sexual Problems: Do you have a partner? Yes/No If yes: Male / Female Sexually active? Yes / No				
Problems :	Desire	Gaining an erection	Maintaining erection	Reaching orgasm
	Ejaculation	Pain	Leakage	**Other:**

Bowel Function:			
B/O frequency		**Faecal IC**	Solid / Liquid
Bristol Stool Score			
Stool Consistency		Frequency	Daily >1/week <1/week >1/month
Constipation		Severity/Amount	
Defecation: Straining? Perineal support? Manual Evacuation?		Faecal Staining	
		Flatal control	Good / Variable / Poor
Incompl. Emptying			
Need to wipe++		Urgency	
Hemorrhoids			
Blood in stool		Deferment time	

Sign and Print Name……Date…….

Figure 2. Subjective men's health assessment form.

are currently sexually active, and if not, whether they wish to be. Some men will report that they have not been sexually active for a while and are content with this decision, i.e. it is not currently a priority for them. Often, when a cancer diagnosis is given, the understandable priority is to be cancer-free, regardless of the consequences of this choice. It is important to ensure that the patient has been educated about the impact of surgery on erectile function during the initial physiotherapy assessment. Although the subject is also often addressed by the nurse specialist, it is important that this is never presumed. The answers to a full range of questions regarding bowel health and symptoms are vital to tackling any symptoms preoperatively that could add any further stress to the pelvic floor. The most important things to note would be any sign of constipation and defecation technique.

The objective assessment includes preliminary observation of the perineum and testicles during pelvic floor muscle (PFM) activation, and then, with consent, an anorectal examination. Most men are happy with such an assessment because of the nature of the testing that they will have undergone before this point. Providing a privacy blanket, and informing the patient that he can hold his penis over his pubic bone with this covering, can make him feel more comfortable.

Use of real-time ultrasound

Real-time ultrasound (RTUS) provides clear biofeedback, and is of great benefit to this cohort of patients. Men often struggle to engage their PFMs alone, commonly showing a great deal of co-contraction or only use of global muscles. Patients often report that they cannot "feel much", and often expect to experience a bigger contraction. Doorbar-Baptist *et al.* (2017, p. 296) confirmed that RTUS is reliable to use for the assessment and "attainment of pelvic floor control in men with prostate cancer", and that it was most effective preoperatively.

Outcome measures

Outcome measures are important methods of tracking the progress of any individual. In this group of patients, these measures can be helpful in fully establishing baseline symptoms preoperatively, and showing men their postoperative progress. Outcome measures can demonstrate that, even though patients may not be completely dry, they have still made significant progress. Such improvements can be missed as a result of the frustration caused by ongoing leaking. It is important to use two outcome measures to evaluate levels of incontinence and ED. The measures that the present authors regularly use are: the International Consultation on Incontinence Questionnaire – Urinary Incontinence – Short Form (ICIQ-UI-SF); the International Consultation on Incontinence Questionnaire – Male Lower Urinary Tract Symptoms (ICIQ-MLUTS); and the abridged, five-item version of the International Index of Erectile Function (IIEF-5).

Treatment

Preoperative physiotherapy treatment should include extensive education about the anatomy of the pelvic floor using a model and diagrams. This is often the first time in a man's life that he has been made aware of his pelvic floor, and an understanding of its role and function is critical to adherence to and compliance with exercises. Patients are taught PFM exercises (PFMEs) during the anorectal examination, which will establish the best cue for each individual. A key finding from a study by Stafford *et al.* (2012) was that not all men respond in the same way to the normal cues that are used; for example, hold wind and gently lift the testicles, or hold wind and think about shortening the penis. Patel *et al.* (2013, p. 987) highlighted that prehabilitation is beneficial because it promotes an understanding of "pelvic floor muscle activation in the absence of [postprostatectomy urinary incontinence] and pain".

Another important aspect of treatment is education about pads, and having samples in the clinic can facilitate this discussion. TENA Men (www.tena.co.uk/men) will send out free samples that can be displayed and distributed. It is important to remember that men are not used to wearing pads, unlike women during their monthly menstrual cycle, and therefore, this can be daunting for them. Without correct education, they can end up buying female incontinence pads that are not shaped to suit their anatomy. Male pads are not always widely available in supermarkets, and therefore, showing men what they need to get and helping them to obtain these in advance will greatly help patients in the postoperative period. During this time, directing men to support groups and supportive education can be beneficial. The Prostate Cancer UK website (https://prostatecanceruk.org) has a number of helpful videos, some of which feature men talking about their experiences, which can be extremely powerful for someone about to undergo surgery.

What does the evidence say?

Goonewardene *et al.* (2018) conducted a systematic review of nine studies examining the impact of prehabilitation on continence outcomes after prostatectomy. Their conclusion was that the results were "overwhelmingly in support" of prehabilitation, and "[s]trengthening the pelvic floor muscles was shown to significantly improve post-prostatectomy urinary continence" (Goonewardene *et al.* 2018, p. 397). Therefore, these author recommended that all men undergo preoperative PFM training (PFMT) in order to maintain normal pelvic floor function postoperatively.

Laurienzo *et al.* (2013) published a randomized control trial (RCT) of the effect of electrical stimulation and PFMT on muscle strength, urinary incontinence and erectile function. The participants were seen preoperatively, and at 1, 3 and 6 months after surgery. The groups were: a control group in which only verbal instructions to contract the perineum were given; an exercise group who attended 10 preoperative physiotherapy sessions to learn PFMEs; and an electrical stimulation group who had 10 sessions of electrical stimulation and PFMEs. Immediately after surgery, all participants suffered from reduced PFM strength, ED and poor quality of life (QoL), which demonstrates the impact of prostatectomy on the pelvic floor. The results showed that there was improvement in all groups at 3 and 6 months after surgery. There was no significant difference between the groups.

A meta-analysis of 11 studies by Chang *et al.* (2016, p. 464) "demonstrated a significant 36% reduced risk of postoperative incontinence at [3 months after RRP] if preoperative PFME was undertaken". There were no significant findings at 1 or 6 months. These authors showed that there are conflicting results in the current evidence base for preoperative PFMEs. Six studies showed benefits and five failed to do so. Therefore, Chang *et al.* (2016) concluded that preoperative PFMEs may aid early urinary incontinence recovery and increase QoL.

Wang *et al.* (2014, p. 7) conducted a meta-analysis of five studies, and concluded that "additional preoperative PFMT did not improve the rate of reestablishment of continence" after RRP at 1, 3 or 6 months, or 1 year following surgery. However, this conclusion should be viewed with caution because of: the small number of studies included; and the considerable heterogeneity between studies in terms of the duration and frequency of preoperative PFMEs.

A prospective, randomized controlled clinical study by Tienforti *et al.* (2012) involved 34 men who underwent open RRP. Treatment included one preoperative biofeedback session for 20 min with a monthly follow-up after surgery for the intervention group. Tienforti *et al.* (2012, p. 1007) concluded that "a single preoperative supervised training session with [biofeedback], combined with a postoperative programme of PFMT, including assisted training sessions on a monthly basis only, is effective in improving the recovery of incontinence after open [RRP]".

Patel *et al.* (2013) conducted a retrospective analysis of 284 men who had undergone RRP. Treatment for the intervention group included education about: the structure and function of the bladder, urethra and PFMs with models and diagrams; pelvic floor activation in different functional positions; and the use of transabdominal ultrasound for biofeedback. The control group received verbal instructions about PFMEs from the surgeon. The results showed that physiotherapy-guided PFMT begun 4 weeks before RRP significantly reduced the severity and duration of incontinence at 6 weeks after surgery. However, this level of significance was not demonstrated at 3 months after surgery. Patel *et al.*'s (2013) results support other studies by Centemero *et al.* (2010), Parekh *et al.* (2003), Burgio *et al.* (2006) and Sueppel *et al.* (2001), all of which had smaller sample sizes.

Postoperative rehabilitation

If patients are seen preoperatively, then the time of the postoperative review will vary depending on: their preoperative lower urinary tract symptoms; and the strength of their pelvic floor muscles. The average postoperative review time is 2 weeks. This is normally just after the catheter has been removed so as to allow time for the anastomosis to be rested and heal (see Fig. 1).

First postoperative review

During the review, it is important to identify the lower urinary tract and erectile symptoms that are present. These can be documented using the assessment form shown in Fig. 2. A recent review by Glazener *et al.* (2011) reported that a staggering 89% of men were still incontinent at 6 weeks after surgery. The results of any outcome measures, such as the ICIQ-UI-SF, ICIQ-MLUTS and IIEF-5, should be assessed. Another simple outcome measure of incontinence is pad usage (i.e. the number and size used). In practice, clinicians must remember to

document when patients change the pad and its size, i.e. with each leak or once saturated, because the number of changes alone is not a true indicator of continence. This outcome measure has to be combined with perceived continence either verbally, or with the ICIQ-UI SF and/or ICIQ-MLUTS.

It is important to rule out any serious red flags at this early stage. Age and previous comorbidities are two common risk factors for postoperative complications; for example, deep vein thrombosis, urethral obstruction, rectal injuries and wound infections (Alibhai *et al.* 2005). Although the level of risk is very low, it is important to monitor patients for any complications.

Key aspects of the review are outlining goals for patients, and providing them with rough timelines that they should aim to follow; for example, Joanne Milios's (2018) pad protocol:

- First, aim to be dry at night within 3 months. This shows that the bladder's autonomic function has returned, and that the detrusor muscle can stretch overnight.
- Once dry at night for three consecutive nights, remove pad.
- Aim to reduce the size of the pad worn during the day.
- Delay pad usage till midday if you are only leaking because of muscle fatigue in the afternoon.
- Use a pad only for special occasions/sport; for example, when doing a high-level activity that results in SUI.

Depending on a patient's symptoms, normal bladder retraining, fluid intake advice, constipation avoidance and PFMT can be required, and these treatment options can be enhanced by the use of RTUS to give the man feedback on his PFM technique. Once the patient's continence is improving, the aim of treatment would be to build more functional and dynamic exercises into his exercise programme. This approach helps to give men more confidence about returning to their previous sports/hobbies, if they are able, in order to challenge their pelvic floor with more-dynamic exercise positions.

Evidence for improving urinary incontinence

Ribeiro *et al.* (2010) conducted an RCT comparing weekly PFM biofeedback sessions over 3 months following an RRP with verbal information on PFMEs taught by a urologist alone. At 3 months, 73% of participants in the treatment group were continent, as compared to 39% of the control subjects. Both groups made improvements, but the use of regular biofeedback hastened their recovery of continence.

A study by Overgård *et al.* (2008) followed a high-quality RCT by van Kampen *et al.* (2000) that compared weekly physiotherapy/PFMT follow-up with a no-follow-up control group. Van Kampen *et al.* (2000) found that 88% of participants in the treatment group were continent at 3 months, as compared to only of 56% the control subjects. Overgård *et al.* (2008) wanted to find out if the same results could be achieved with less-intensive follow-up. The treatment group were seen from immediately after catheter removal until they were dry. They received 45-min biofeedback sessions every week. The control group received only verbal information from a urology nurse. At 12 months, the results for the treatment group had statistical and clinical significance (92% continent versus 72%); however, there was an improvement in both groups. Overgård *et al.* (2008) found that face-to-face follow-up improved patient adherence to PFMEs, and therefore, improved continence.

Glazner *et al.* (2011) undertook two parallel RCTs of the effect of formal, one-to-one physiotherapy following RRP or transurethral resection of the prostate (TURP). The participants were all still incontinent at 6 weeks. The authors compared four sessions of physiotherapy over 3 months with standard care and lifestyle advice. At 12 months, there was no significant difference between the groups; however, there was no true control group since all the participants knew about PFMEs. Like Overgård *et al.* (2008), Glazner *et al.* (2011) demonstrated that more-frequent face-to-face follow-ups brought about greater improvement.

Anderson *et al.* (2015) published a Cochrane Review of 50 RCTs or quasi-RCTs that looked at both RRP and TURP, which meant that there was great variation in interventions and outcome measures. In light of this, there was no clear support for physiotherapy intervention in preventing or reducing urinary incontinence following RRPs and TURP. The evidence was very contradictory, and only proved that further rigorous RCTs are still required to obtain a definitive answer.

Erectile function

It is important to give patients support with and advice about the use of vacuum devices to aid

their recovery of normal erectile function. It is also crucial to reinforce the importance of doing PFMEs since these can promote oxygenation, and thus, stimulate the release of endothelial cell growth factor. This encourages nerve regeneration and enhances muscle power, both of which benefit erectile function in turn (Lin *et al.* 2012). Contraction of the bulbospongiosus and ischiocavernosus muscles helps to initiate and maintain intracavernosal pressure. This prevents backflow of blood from the penis, and thus, maintains erections. In all cases of rehabilitation, enhancing muscle power increases oxygenation to the injured tissue. If the corpora cavernosa smooth muscle is not becoming engorged with daily/nocturnal erections, which can occur up to 20 times over 24 h in men prior to surgery, there is a high risk of atrophy and tissue death. This causes a loss of penis length and circumference, and is most likely to occur between 4 and 8 months after RRP. The early use of vacuum devices is recommended to reduce the chances of this happening.

What does the evidence say about promoting erectile function?

Raina *et al.* (2006) conducted an RCT of the impact of the early use of a vacuum-controlled device (VCD) to improve erectile function following RRP. This study included 109 participants who had undergone RRPs that involved both nerve-sparing and non-sparing surgeries. These participants all had to have been sexually active and without any comorbidities prior to having the RRP. The men were split into two groups: those who used a VCD to gain erections; and those who received no erectile treatment. The treatment group used a VCD daily, and on average, they began treatment 3.9 weeks after undergoing RRP. At 9 months after RRP, there was a significant improvement in the IIEF-5 scores of the treatment group. There was no difference between the IIEF-5 scores of the participants who used a VCD, regardless of whether they had undergone non-nerve-sparing or nerve-sparing surgery. The IIEF-5 scores of the control group were significantly lower.

Lin *et al.* (2012) published an RCT examining the prevalence of sexual dysfunction after RRP, and the efficacy of improving sexual function with PFMEs. A specialist physiotherapist taught participants in the treatment group to perform PFMEs daily once the catheter had been removed. The control subjects received training from a urologist in the third month after undergoing RRP. Both groups experienced severe sexual dysfunction following surgery. At 6 and 12 months, there was a significant difference in the participants' IIEF-5 scores, with the treatment group exhibiting improved sexual function.

Prota *et al.* (2012) conducted an RCT of the effects of pure PFM training on a return to potency. The treatment group were given weekly biofeedback sessions over 12 weeks. The control group were only provided with verbal information about PFMEs. At 12 months, there was a statistically significant improvement in potency in the treatment group: 47% versus 12.5% in the control group. Both groups had similar numbers of men who had undergone nerve-sparing surgeries, and therefore, this would not have had an impact on the overall results.

Key points for service development

In both the National Health Service and private settings, it is important to know and maintain contact with those who refer patients. A study by Hirschhorn *et al.* (2013) found that, in order to improve patient adherence to physiotherapy when undergoing an RRP, it was crucial that they were given a named physiotherapist to see. With this in mind, it would be pertinent to approach the following:

- general practitioners;
- clinical nurse specialists;
- medical representatives (MEDicare); and
- consultants.

When making these connections, it is important to make health professionals aware of how physiotherapy can treat ED and urinary incontinence following RRP. Medical representatives can keep clinicians up to date with the latest devices for alleviating ED and improving QoL.

From the evidence, it is clear that frequent follow-up is key to hastening a patient's recovery from postoperative symptoms. Men are more likely to return to a higher level of function if they are seen over a longer period of time.

Conclusion

Considering all the evidence, a mixed picture emerges of the effectiveness of physiotherapy in the reduction of urinary incontinence and ED following RRP. Further rigorous research will be crucial to gaining a clearer understanding of this issue. The best outcomes were reported in studies in which patients were seen at least 6 weeks preoperatively, which allowed them more time to

achieve the best PFM strength that they could, and then continued to be seen face-to-face post-operatively. In the majority of the literature, men who were taught PFMEs by a specialist physiotherapist were able to reduce the time that they were incontinent. The return of erectile function was also directly linked with the return of continence, and the early use of VCDs.

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