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# The Role of Physiotherapy in the Pre and Post Treatment Interventions in Prostate Cancer Patients

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Additional information is available at the end of the chapter

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## 1. Introduction

### 1.1. Cancer and physiotherapy

Cancer is the common term for all malignant tumours and its consequences are a concern for people worldwide. Advances in health and medical science procedures (early diagnosis, improved chemotherapy and radiotherapy) and surgical techniques, and their utilization in the field of oncology, have significantly improved survival and have thus strongly influenced the practice of physiotherapy [1, 2, 3, 4].

People are living longer with their cancers, which in many cases are treated as chronic disease, due to the early detection and advances in treatment options. Thus, physiotherapists require greater knowledge of the clinical conditions and improved skill in managing patients with cancer, before, during and after the specific medical procedures. They also have the responsibility of managing and treating patients during the pre and postoperative periods with the provision of the best particular physiotherapeutic intervention to each patient [5, 6].

Besides the knowledge about clinical interventions, the physiotherapist needs to be in contact with the recent advances in the scientific literature in general. Moreover, this professional must know about the risk factors to cancer and participate in actions to aid in the prevention of this disease [5, 6, 7].

In oncology, for example, there is increasing evidence, initially only from epidemiological studies but increasingly from individuals case studies, that risk of some cancers, such as prostate, may be reduced in people living in areas of high ambient solar radiation or with high sun exposure than in those where the converse is the case. Naturally, the informa-

tion about the protection against the unnecessary exposition of the sunlight is also very important [8, 9].

Images are suitable tools to aid in the early diagnosis of several types of cancer. However, some modalities of images, as the positron emission tomography (PET) depending on the radiopharmaceutical, and in some clinical condition, false negative information can be obtained. As a professional of an interdisciplinary team, the physiotherapist must have enough knowledge to suggest a modality of image and to know about the limitations of each procedure [4, 10, 11].

Epidemiological researches have put in evidence the benefits of physical activity in relation to the risk of cancer. Moreover, the physical activity has been considered as a modifiable lifestyle risk factor that has the potential to reduce the risk of the majority of the types of diseases, as the cancer. The physiotherapist must be also involved in public and private actions to guide the Society to have correct style of the life also related to adequate exercise (kinesiotherapy) and physical activities in general. Naturally, these actions must consider the individual characteristic of each subject [5, 12].

Undesirable clinical conditions due to the use of some techniques to treat cancer can bring bothersome that can comprise the sexual health and the quality of life. It is important that the interprofessional team be prepared to discuss these questions [13, 14].

## **2. Role of physiotherapy**

Physiotherapeutic procedures have an important role in the healthcare of people of all ages and with different types of clinical status. These procedures are relevant in the treatment, in the prevention of diseases or complications and in the management or treatment of undesirable pathological conditions to thus minimize the impact these may have in the quality of life of the patient [7].

Physiotherapy is a profession defined by great diversity in areas of clinical practice with the purpose of developing, maintaining and restoring the maximum movement and functional ability of each person, considering the specific limitations of the individual. The role of the physiotherapist within the interdisciplinary group (physician, nurse, nutritionist, occupational therapy, social worker, psychologist, speech therapist) is well defined in various clinical conditions, as with the patient with cancer [5, 7].

The pressing need arises for the existence of a differentiated care system with the purpose to cater for the particular needs of the patients and their families. It is desirable that the physiotherapist working in oncology has a broad knowledge of other clinical areas, such as neurology, the musculoskeletal and cardiopulmonary systems and in rehabilitation and kinesiotherapy in general, as well as in services along the entire spectrum of patient care. There is also a considerable role for the physiotherapists in the evaluation of the clinical conditions and management of the patients, as well as in assisting people's return to work and normal life following treatment [6, 14].

It is often the fatigue and weakness caused by the disease and/or its treatment that delay this return to normal functions and limit the quality of life of a specific individual. An important aspect related to cancer and its treatment is the typically induced muscle atrophy. Probably this clinical condition is due to perturbations in different pathways of the muscle protein metabolism, including decreased muscle protein synthesis, increased muscle protein degradation, or a combination of both [5, 12, 15].

The most prevalent symptom in cancer is fatigue, which has now overtaken pain as the most common distressing symptom of the disease. The intensity of the fatigue varies from patient to patient and it is a complex and subjective phenomenon. Non-pharmacological fatigue cares are desirable. There is much evidence to suggest that appropriately prescribed physical exercises (kinesiotherapy) play an important role in the decrease of cancer fatigue and the improvement of the quality of life of the patient. The reduction of fatigue is highly relevant and desirable for the patient to (i) have the ability to continue or return to work; (ii) develop daily activities at home; and (iii) participate in social activities, all of which are clear parts of the overall quality of life of the patient [2-4, 15, 16]

It is thus essential that physiotherapists working with cancer patients have a clear and comprehensive understanding of the individual cancers and their staging and development, as well as the techniques that are being used in the diagnosis and treatment of the patient. The physiotherapist must have knowledge of the consequences and complications of clinical procedures, such as surgery, chemotherapy and radiotherapy, and their potential side effects such as neuropathies and cardiomyopathies. Moreover, the physiotherapist must be informed about the specific procedures that were used in the patient during medical intervention. A discussion about these procedures and the possible complications and occurrences are relevant to the management of the patient before and after the surgery. In addition, the physiotherapist must also know how these medical procedures can affect the physiotherapeutic interventions and thus select the best and convenient procedure for each patient [5, 7, 14]

The physiotherapist also needs to know more about individual medications as patients can survive longer using new cancer treatments, but often with severe side effects, which leave them weaker and often feeling quite unwell during the process. Hormonal therapy, for example, has an important effect on the muscle mass. The decrease in muscle mass, leading to muscle weakness and general debility, can be minimized by specific kinesiotherapy programmes. These appropriated exercises are established and implemented by physiotherapists considering the anatomical area of the disease and specific capabilities and limitations of each patient [5, 6, 7, 14].

Whole body vibration exercises (WBV) performed in oscillating platform could be a good option to aid the patient with cancer. The vibrations generated in these platforms can be transmitted to body of the patient, and, it is suggested that, in appropriated conditions, these vibrations could improve walking function, muscle strength, bone mineral density, cardiovascular fitness and body balance. Moreover, the health-related quality of life is increased and the fall risk is decreased. The frequency and the amplitude of the vibration can be totally controlled by the physiotherapist that is supervising the clinical procedure. The

duration of the work, as well as, the time to rest, the number of sets in a session and the number of sessions are also controlled. All these conditions depend on, mainly, the clinical and physical conditions of the patient. The mechanisms responsible for the WBV benefits are not fully understood, however it is hypothesized that these effects are probably related to direct and indirect actions. The direct effects would be related with the transmission of energy of the vibration, for example, to a muscle that would be stimulated. The indirect effects might to be associated with the neuroendocrine system. Whole body mechanical vibration on the muscle performance would be due to the induction of a myotatic reflex contraction referred as the tonic vibration reflex [17, 18, 19].

Normally, the person is standing on the platform, but other positions are possible, as it is shown in the Figure 1. It is possible to see in the Figure 1.c that the man has bent knees.



**Figure 1.** Some of the positions of the person in the oscillating platform. (a) sitting, (b) sitting in a chaise and the feet in the platform, (c) standing.

Physiotherapists utilize physical agents, such as therapeutic exercises (kinesiotherapy), electrotherapy and manipulative therapy to provide a holistic approach to the prevention, diagnosis and therapeutic management of clinical disorders, as well as possible future complications [5, 7]. Involving the movements of the body and the optimization of the functions of the tissues, they aim to enhance the health, welfare and quality of life and thus they can play an important role in the management and rehabilitation of patients with prostate cancer (PCa). In patients with PCa, the physiotherapist will also guide the patient in relation

to the knowledge and understanding of the anatomic structures related directly with the pelvic floor, the correct breathing and the perception of the muscles of the pelvic floor, as other muscles of the pelvis. Specific attention is given to the comprehension of the functions of these muscles, especially to the levatorani muscle [20-26]

Sexual health is a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity. Sexuality is considered as a personal and human dimension that is characterized as a strong aspect of the human personality and it is an aspect of the emotional and physical intimacy that men and women experience through their lives. Moreover, sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs, attitudes, values, behaviours, practices, roles and relationships [27, 28, 29]

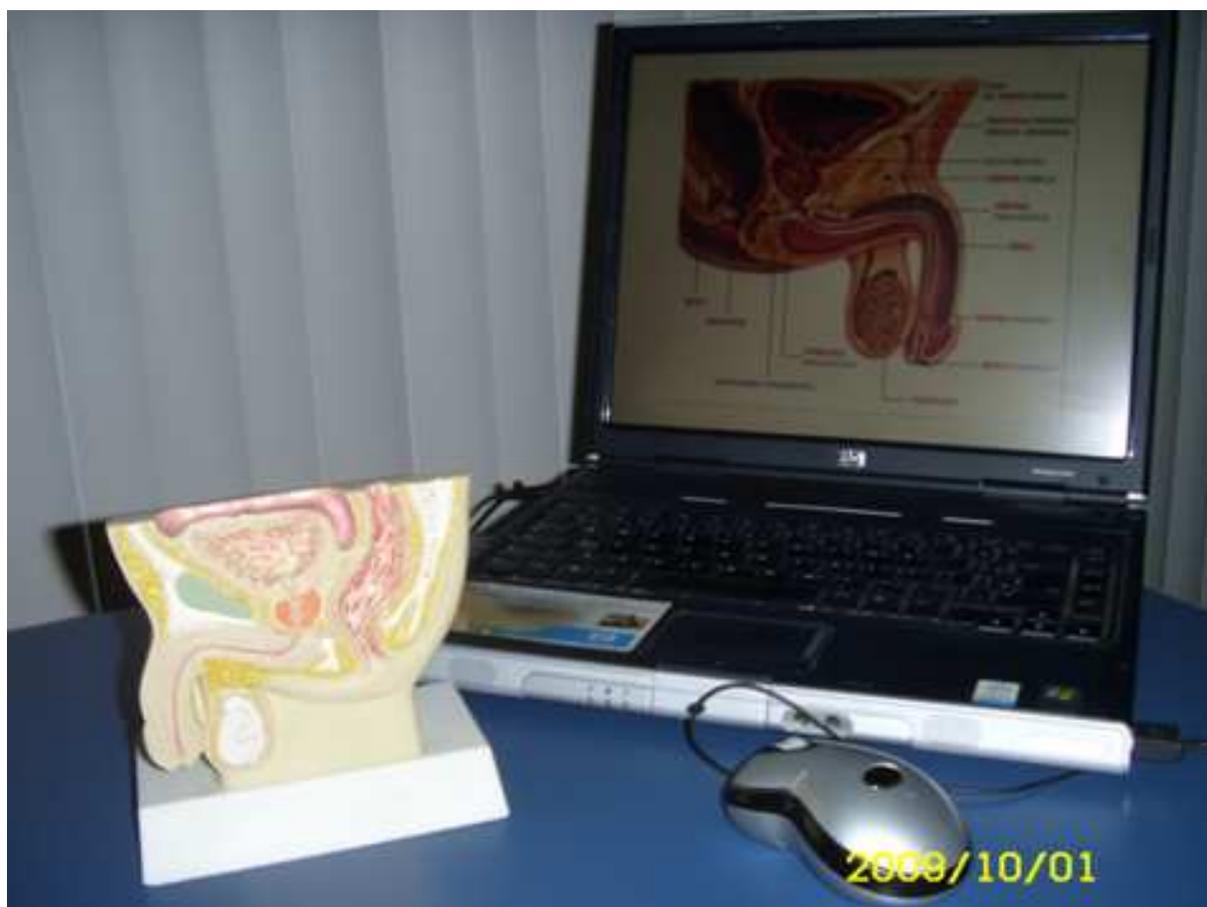
Sexuality is influenced by the interaction of biological, psychological, social, economic, political, cultural, ethical, legal, historical, religious and spiritual factors. Sexuality is present from the conception up to the dead and it consists of three interrelated and inseparable aspects, that are biological, psychological and social. In consequence, particular attention must be done to the relevance and role of the organs related to the biological components involved in the sexuality [29, 30]. The importance of the comprehension of the possible undesirable consequences of the clinical procedures used to treat the PCa must be discussed with the patient and/or with the partner. The physiotherapist must have also knowledge about the sexuality to define specific exercises and techniques available to aid the patient with PCa in different steps of his life, as well as the limitations of these and other procedures. [6, 14]

Figure 2 shows some tools used to explain the patient about the anatomic structures directly and indirectly involved with the prostate and the structures that can be damaged in the surgery for the treatment of the PCa.

During the final stages of cancer treatment, the palliative care becomes paramount and the participation of the physiotherapist is also desirable in the interdisciplinary team. The care with the patient with cancer will contribute to minimize the progression of secondary symptoms [5, 6, 26].

The correct and appropriated mobilization of the scars to avoid adherence and important alterations in the posture of the patient is also highly relevant. This procedure contributes to the improvement of the quality of life of the patient immediately and in the future [5].

Procedures of the physiotherapy in palliative care is also used for pain, lymphoedema, dyspnoea and other symptom assessment and treatment, as well as for the education on safe transfer and mobility management of the patient. Constipation, nausea, sleep disturbance (insomnia), anxiety, fatigue, dyspnoea, pain scores and appetite are all improved by physiotherapeutic intervention. Some of these clinical complications can be also prevented or minimized. Along the time, the lymphoedema management in the terminally diseases has developed more effectively, with evidence supporting the complex physiotherapy treatment and the integration with other professionals [5, 7, 16].



**Figure 2.** Tools used to explain to the patient about the anatomic structures of the pelvic floor

### 3. Prostate cancer in the world

Cancer is an important public problem and is considered a national health priority area in several countries due to the burden that it places on the individual, families and the community [1, 2, 31].

The World Health Organization (WHO) develops strategies towards the prevention, research, education and control of the cancer. Important medical developments and relevant scientific findings have permitted that people with cancer can survive with their disease and with the side effects of their disease and its treatment for longer [31].

The high relevance of the cancer in public health and research activity can also be demonstrated by the number of scientific research identified in the database system PubMed (a service of the National Library of Medicine and the National Institutes of Health) [32].

It is possible to see in the Table I, the number of publications in the PubMed related to cancer and cancer and some organs. It is possible to identify in the Table I approximately 2 700

000 full papers in this databank with the keyword cancer and 2.22% of these publications are related with PCa.

The mainly risk factors for PCa are (a) age (it is the strongest risk factor for PCa and the probability of developing this disease is 1 in 12,833 for men aged birth to 39, 1 in 44 for men aged 40 to 59, and 1 in 7 for men aged 60 to 79 years), (b) family history (greater risk if father or brother had the disease and slightly higher for men whose mothers or sisters have had breast cancer), (c) Race/Ethnicity (greater risk among African American men compared with white, Asian, and American Indian men), (d) prostate changes (abnormal cells described as high-grade prostatic intraepithelial neoplasia), and (e) diet (food with high animal fat and low in fruits and vegetables). Moreover, between 5 to 10% of the PCa cases are believed to be due primarily to high-risk inherited genetic factors or PCa susceptibility genes. Genetic testing has been a reality and it has been well documented that genetic factors might increase the risk of cancer onset [33, 34].

Keyword	Number of publications
Cancer	2 656 222
“Breast cancer”	49 804
“Prostate cancer”	59 245
“Colorectal cancer”	47 010

**Table 1.** Number of publications in the PubMed with keywords related to cancer

PCa is the most common solid cancer in men worldwide and is the most common of all cancers in the North America. In an epidemiological study was reported that the estimated PCa incidence rates remain most elevated in North America, Oceania, and Western and Northern Europe. Mortality rates tend to be higher in less developed regions of the world including parts of South America, the Caribbean, and sub-Saharan Africa. Increasing PCa incidence rates were observed in 32 of the 40 countries examined, which clearly demonstrates the increasing problem related to this disease, that it would be not desirable. However, PCa mortality rates decreased in 27 of the 53 countries under study, whereas rates increased in 16 and remained stable in 10 countries [2, 15, 33, 34].

#### 4. The importance of the early diagnosis of the prostate cancer

The early diagnosis of PCa has been facilitated by the determination of the prostate specific antigen (PSA), rectal touch and ultrasonography, which has subsequently led to a high cure

rate in the early stages (stage I/II) of the disease. However, it is important to have in mind, that these current diagnostic techniques have not, in several cases, sufficient specificity and sensitivity to determine the stage and aggressiveness of the PCa and to identify appropriate treatment [2, 6, 35-37].

International guidelines support opportunistic PSA screening in well-informed patients and recommend a baseline PSA at 40 years of age. Although some relevant controversies continue about the real benefit of the screening program, the undisputable finding is that an increasing percentage of young men have an early PCa diagnosis and this condition has the advantage to permit curative interventions [2, 35-37].

When a man has the PCa early diagnosed, he has a number of treatment options, which carry similar success rates. Surgery, brachytherapy or external beam radiotherapy in combination with several months of initial hormone treatment all carry the same chance of cure but they all have very different recovery times, or number of visits to the hospital to consider [4, 6].

Concerning to the recurrent PCa, a key treatment decision is based on whether the disease is only localized in the prostate fossa. If the sites of cancer in the early phase of recurrent disease were known, patients would be treated properly, leading to fewer side effects, a better prognosis with curative approaches, and reduced treatment cost. Nuclear medicine imaging has been considered a reliable technique to be used with this purpose and an important aspect of the nuclear imaging that should be understood is that this type of imaging demonstrates physiology rather than anatomy [4, 6, 10, 11].

PET is a nuclear medicine technique for tumor imaging. The radiopharmaceutical  $^{18}\text{F}$ -FDG was firstly introduced to image brain tumors. Along the time, this radiopharmaceutical has been widely accepted and it was considered a highly effective and successfully way to image several types of cancers. In consequence, investigations using  $^{18}\text{F}$ -FDG were performed to evaluate the use of this radiopharmaceutical in the diagnosis of the PCa. Unfortunately, in general, the PCa can not be imaged with this radiopharmaceutical. This poor performance of  $^{18}\text{F}$ -FDG is mainly related to the low glucose metabolic rate in the PCa, as well as, a relevant excretion of the radiopharmaceutical into the adjacent urinary bladder. Moreover, it is well known that the ability of FDG-PET to detect cancer is based on an increased expression of cellular membrane glucose transporter and enhanced hexokinase II enzyme activity within the tumor cells, where the  $^{18}\text{F}$ -FDG undergoes enzymatic transformation to FDG-6 phosphate [10, 11].

Due to the limitations to use the  $^{18}\text{F}$ -FDG to detect PCa, other molecules to be labeled with a radionuclide, to be utilized as PET-radiopharmaceuticals, have been investigated with this purpose. Choline is a substrate for phosphatidylcholine, which is incorporated into cell membrane phospholipids, and is not dependent on cell proliferation and this molecule can be labeled with  $^{11}\text{C}$  or  $^{18}\text{F}$  for detection.  $^{11}\text{C}$ -choline has been shown to be superior to  $^{18}\text{F}$ -FDG to detect PCa, in part due to its negligible urinary secretion.  $^{11}\text{C}$ -choline PET has been shown to be able to localize primary PCa to the fossa of the prostate gland in up to 86.5% of patients and localize lymph node spread in up to 81.8% of patients [10, 11].

Another molecule, acetate, as 18F or 11C-labeled acetate, which is involved in cytoplasmic lipid synthesis, has been investigated to detect PCa. The retention of radiolabeled acetate in PCa cell lines has been shown to be related to fatty acid metabolism and enhanced beta-oxidation pathway. As PET-labeled acetate has minimal urinary activity, it is considered very suitable for evaluation of local prostatic disease with a high sensitivity for PCa lesions. When compared with 18F-FDG-PET for detection of primary tumors, there is a markedly increased sensitivity of 11C-acetate PET compared with 18F-FDG-PET, and the uptake of 11C-acetate is higher if the PSA is >3 ng/mL [10, 11].

The considerations about the early detection of the PCa is necessary, due to, there is considerable variation in the likely side effects and risks of long-term consequences such as urinary incontinence (UI) and erectile dysfunction (ED) in patients with PCa. With the early diagnosis there is an expectation of curing cancer, minimizing the risk of UI and ED and increasing the quality of life of the patient [38-41].

In general, radical prostatectomy (RP) is a curative and appropriated therapy for any patient whose tumour is clinically confined to the prostate, has a life expectancy of 10 years or more, and has no serious co-morbid conditions that would contraindicate surgery. Other factors affecting treatment decisions include patient factors, such as (i) Current symptoms (International Prostate Symptom Score, urinary flow rate), (ii) Current age (preference under the age of 70 years), (iii) Concurrent illnesses may determine suitability or not for surgery, (iv) Patient preference (psychological factors including patients ideas, concerns and expectations). Tumor/cancer factors, such as (a) Grade of tumour (the "aggressiveness" determines the risk of relapse), (b) Stage of tumour (determines radical or palliative approach), (c) Chance of response to treatment, (d) Chance of recurrence, and (e) Possibility of second curative treatment modalities if the first treatment fails must be also considered [6, 34, 38-41].

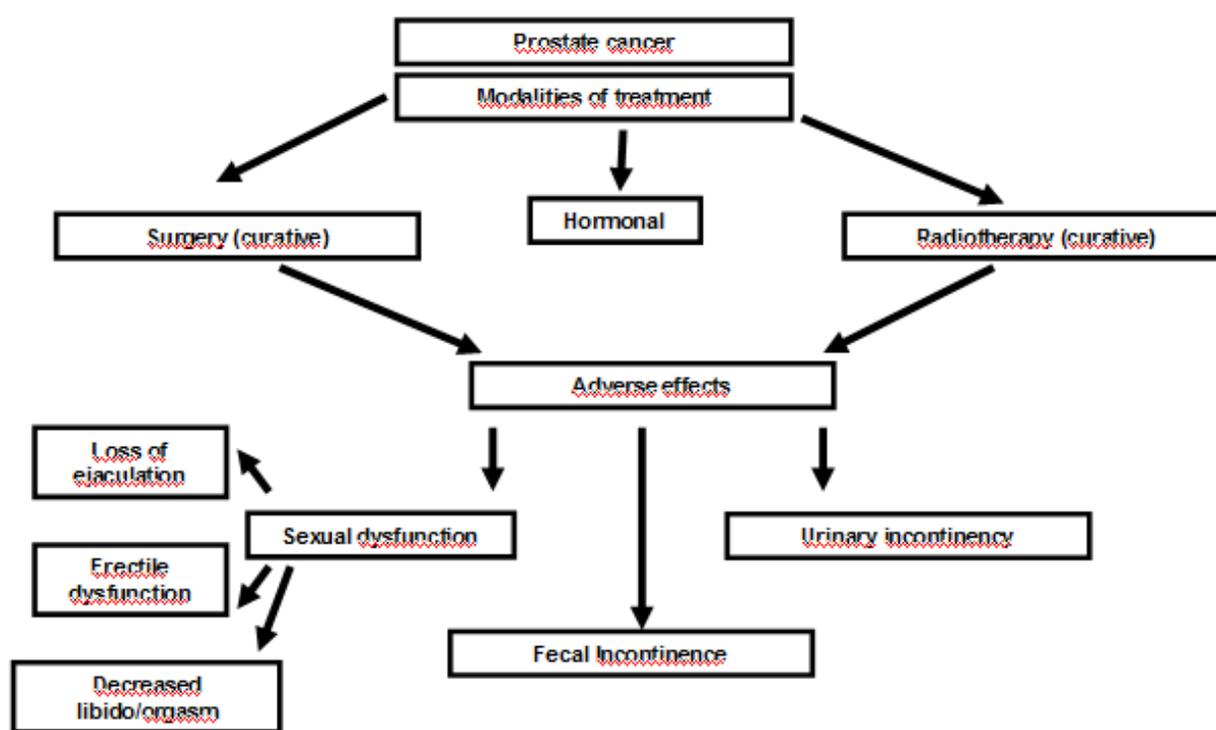
It is also important to consider that the risk of death under the anaesthetic for a RP is about 1 in 250 patients. The procedures used in the surgery become technically more challenging when the patient is overweight or obese and the risks of surgery increase. Improved knowledge about the anatomy of the organs of the pelvis and the muscles of the pelvic floor and the functions related to them had resulted in major improvements in this surgical technique [38-41].

Radiation therapy (RT) is another option for treatment of PCa. RT uses high-energy X-rays or other types of ionizing radiation to try to kill the cancer cells in various organs/tissues. There are mainly two types of radiotherapy: (i) External radiotherapy that uses a source of ionizing radiation that is outside of the body and (ii) Internal radiotherapy that uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer (brachytherapy). The external radiotherapy is a complex procedure and requires the patient to make a number of steps, as (i) positioning and immobilization of the patient, (ii) localization of the tumor, (iii) determination of the size of the tumor, (iv) delineation of the target (tumor) and critical tissues structures in the neighborhood, (v) dose prescription, (vi) type of ionizing radiation, (vii) treatment planning, (viii) simulation and verification of the treatment and (ix) evaluation. Concerning to the brachytherapy to the PCa, several radioactive seeds (in general with iodine-125) are implanted into the prostate gland

with the aim to irradiate the tumor. These seeds are not removed and will be permanently in the prostate. As the iodine-125 emits low level energy electromagnetic radiation, the energy of the radiation is deposited in the prostate, treating locally the tumor [4].

Various severe complications following RT can occur and these complications depend on the type of the procedure used in the treatment. In addition, clinical complications, such as UI and ED have also been associated with the RT [6, 14, 40, 42].

In Figure 3 is shown some modalities of treatment for PCa and possible adverse effects associated with some of these treatments.



**Figure 3.** Modalities of treatment for the prostate cancer and possible adverse effects associated.

As presented before, UI and ED are undesirable side effects normally associated with the RP and RT due to the damage of the muscles of the pelvic floor. [26, 38, 39, 43]

UI has a prevalence ranging from 5 to 60 per cent. UI after RP is the most bothersome complication of this operation and has a major impact on the quality of life and it is therefore of the utmost importance to minimize its prevalence after this kind of surgery. In the clinical routine with the patient that was submitted to treatment to PCa, it is verified that the UI is an unpleasant condition [21, 24, 26].

The types and characteristics of UI secondary to PCa are (a) Stress UI, which is mainly associated with RP; (b) Urge incontinence, which is associated with RT and consists of a strong,

unpleasant and sudden urge to urinate, with burning sensation or irritation in the bladder; and (c) Mixed incontinence, which affects mainly older patients on radiation and/or hormone therapy [21, 24]

In addition to the functional problem of the UI, this clinical condition causes a psychosocial disorder characterized by distress. Moreover, this is potentialised and augmented by the inability of the patient to perform habitual activities. Furthermore, the impossibility of controlling leakage and the resulting feeling of regression, and the inability to overcome the fatigue resulting from the interruption in the number of hours and the quality of sleep in the case of nocturia and anxiety increase dissatisfaction. In consequence, a restrictive social situation can be usually observed, characterized by shyness, shame from the leakage, and social stigmatization and isolation. Additionally, UI may trigger an undesirable, obsessive and strong psychological behavior related to the control of leakage of urine and of associated odors. These factors can increase the anxiety and to cause a reduction of the social life of the patient. Additionally, UI may trigger an obsessive and strong psychological behavior related to the control of leakage and odors. These factors can contribute to cause a reduction of the social life of the patient [6, 14, 20, 24, 42].

The impact of UI on the quality of life of the PCa patient is determined by the self-perception of the severity and the disruption of daily activities caused by the symptoms. An important consideration is that the cases of UI and ED (and other sexual dysfunctions, see Figure 3) recorded in clinics seem to be much higher than the number described in the publications. This discrepancy could be attributed to the great variability of definitions, measurement instruments, and manners of assessing UI. If a good interview with the patient before the treatment of the PCa is not performed, it is also difficult to determine whether the symptom is a result of the treatment of the disease or of the natural involution that would occur with age. Moreover, there is a fatalistic and resigned attitude that makes the patients hide or mask the symptom from the professional or the professional is not prepared to obtain the informations that are relevant to the clinical conditions of the patient [6, 20, 24, 42].

ED, in general, is usually due to a multifactorial etiology, comprising organic, psychological, or mixed aspects, and may often require a multidisciplinary approach for assessment and treatment. Organic causes encompass vascular, neurologic, hormonal, as a result of medications, pelvic surgery (mainly RP), RT, diabetes or mixed factors. In general, any condition that can cause damages to the nerves or impair blood flow in the penis may lead to ED. Pelvic surgery (especially RP and bladder surgery for cancer) might damage cavernous nerves and arteries near the penis, causing ED [23, 30, 39].

Penile erection is the consequence of a complex neurovascular process in which nerves, endothelium of sinusoids and blood vessels, and smooth muscle cells are involved. Several central nervous and peripheral transmitters and transmitter systems participate in the process and the nitric oxide (NO) is the main mediator of penile erection. It is produced by a group of enzymes called nitric oxide synthase (NOS) which utilizes the amino acid L-arginine and molecular oxygen as substrates to produce NO and L-citrulline. The endothelial NOS is constitutively expressed within the vascular system, it is tightly regulated and produces physiologically relevant levels of NO. The investigations about the NO, that can readi-

ly cross plasma membranes to enter target cells, and its functions as a mediator synthesized and released from the vascular endothelium and as a neurotransmitter in inhibitory nerves innervating the penis represented a breakthrough in the comprehension of the neurophysiological basis of erection. Moreover, the synthesis of NO and the consequences of NO binding to soluble guanylylcyclase is essential for the erectile process [44, 45, 46].

Impaired erectile function, or the total inability to maintain or achieve sufficient penile rigidity for satisfactory sexual intercourse performance, it was firstly used as a definition of impotence. In 1992, it was recommended that the term "erectile dysfunction" replace the term "impotence," but, sometimes, the two terms have been used interchangeably. The term ED is more precise and eliminates the confusion of multiple meanings and connotations associated with the word impotence. ED is defined as a "consistent or recurrent inability of a man to attain and/or maintain penile erection sufficient for sexual activity". The condition must be present for a minimum of 3 months to establish the diagnosis. The exception to this is when ED is preceded by trauma or pelvic surgery [47, 48, 49]

In addition, penile erection involves a complex interaction between the central nervous system and local factors. The penis is innervated and regulated by autonomic (sympathetic and parasympathetic) and somatic (sensory and motor) nerve fibers. Overall, erection is a neurovascular event modulated by psychological and hormonal factors. The economic burden of ED is not just limited to the cost of diagnosis and treatment. Subtle impacts on the society that are difficult to quantify are (i) lost time at work, (ii) decreased productivity of the patient due to distress, (iii) impact on the partner and family and (iv) alteration of the social interactions. The comprehensive knowledge and the understanding of these conditions have also reflected in the number of papers published in important scientific journals that have increased along of the years [27, 38, 39, 41, 46].

Reports of studies describing ED after RP have shown a range from 29% to 97.5% with less ED occurring in younger men. Men with ED may suffer from depression and low self-esteem, and experience difficulties establishing and maintaining relationships. Treatment regimens currently available for ED include psychotherapy, sex therapy, oral pharmacological agents, androgen replacement therapy, intraurethral therapy, intracavernosal injections, several procedures related to the physiotherapy and surgery [27, 38, 39, 41, 50].

The pelvic floor muscles, besides other functions, play an important role in sexual activity and contractions of the ischiocavernosus and bulbocavernosus muscles produce an increase in the intracavernous pressure and influence penile rigidity. The bulbocavernosus muscle compresses the deep dorsal vein of the penis to prevent the outflow of blood from an engorged penis. The procedures of the physiotherapy, associated with a interdisciplinary team, including exercises for the muscles of the pelvic floor muscle only or associated with manometric biofeedback, electrotherapy, vacuum pumps can be used successfully in various patients with ED [20-26]

In addition, it is highly desired to consider that beneficial effects of pre- and postoperative pelvic floor interventions (RT or RP) using physiotherapy procedures, since both the duration and degree of UI after RP decrease in these case [24, 51-53].

When a patient with PCa is referred to undertake physiotherapy procedures before the surgery or radiotherapy, it is possible to teach him about the perception of the muscles of the pelvic floor, facilitating the performance of exercises involving these muscles associated with an ideal breathing, just after the RP or RT [6, 22-24].

As it is possible to see in the Figure 3, besides the ED, another clinical conditions related to the sexual functions can appear in the patient submitted to a RP, as the loss of ejaculation and the decrease of the libido and orgasm [6, 27, 39, 41].

The interventions related to the physiotherapy will contribute to aid the patient to live your sexuality. Moreover, it is important to show to the patient that sexuality is not only genitality, but it goes beyond the limits of genital impulse and is characterized as a strong experience of human personality [6, 13, 27, 39, 41].

Several options of treatment are available to treat ED, as psychosexual counseling, medication, use of physiotherapy (exercises to the pelvic floor muscles, electrotherapy, acupuncture and external vacuum devices), intracavernous injection therapy, vascular surgery, and use of a penile prosthesis. The etiology of the ED, the acceptability for the patient, the available information about methods and the success rate have been used to determine the choice of intervention. The clinical interventions used in the physiotherapy provide noninvasive methods that are easy to perform, painless, and inexpensive [6, 39, 41, 50, 51].

## **5. Physiotherapy procedures in the management of the patient with prostate cancer**

The physiotherapist, from his assessment, can also help the patient with PCa in the presurgical period in which the exercises for the pelvic floor and for the respiration that will be performed in the post-surgical period can be learned early by the patient. Moreover, the knowledge and the perception of the muscles of the pelvic floor by the patient will be very important. As these muscles are located inside the pelvis, they are considered a continence muscle group giving structural support for the pelvic organs and the pelvic sphincters (urethra and anus, for exemple in men). Based on urethral continence maintained by muscles of the pelvic floor, the procedures of the physiotherapy of this muscle group can retake the control of the urinary continence or maximize it, also by nerve stimulation, according to the consensus, which can inhibit the detrusor muscle, increasing the quality of life of patients with Pca [20-26].

Patient assessment by the physiotherapist is accomplished through the anamnesis, voiding diary, pad test, data collection of the urodynamic study and/or other complementary examinations, if any, physical examination and specific maneuvers to assess urine leakage [24].

In the interview, beyond identifying the main complaint and history of the patient, issues inherent in urination are of utmost importance to be addressed. The voiding diary is a useful tool because it allows the physiotherapist to objectively quantify the volume of urine loss, as well as the frequency of the urination. As the voiding diary is fully performed by the

patient over a period of about two to three days, with notes of drinking water, the type of the drink, volume voided, urgency severity, quantification of loss and its association to carry out some activity at the time, he is led to observe his behavior voiding, generating his self-knowledge [20-26].

The completion of the pad test lasts one hour, and after that the pad is weighed, depicting the severity of UI. When the weight is less than 3g, the UI is considered light. The UI is moderated to 3 up to 10 g, and over 10g is considered severe incontinence [20-26].

Urodynamic investigations involve the evaluation of the dynamic function of the lower urinary tract. The urodynamic study, an examination of the gold standard, evaluates the morphology, pressure (urethral, vesical and abdominal under static and dynamic conditions), physiology and hydrodynamic transport urine of the voiding mechanism, thus detailing the stages of filling and emptying as well as the sphincter behavior. Common urodynamic findings in post-RP patients are (a) internal sphincter deficiency and (b) bladder dysfunction (detrusor instability and decreased compliance) [20-26].

On physical examination is evaluated the strength and the tone of the pelvic floor muscles through the anal sphincter, perineal sensation and bulb-cavernosum reflex. Maneuver effort, such as coughing, can evaluate the sphincter function, which can be performed with the patient standing, with the bladder full, and where he is asked to simulate cough. From this assessment is given the goal of treatment [20-23].

One of the objectives of the intervention of the physiotherapy is to re-train the muscles of the pelvis by improving the active retention strength of the striated muscles of the pelvic floor in order to overcome the insufficiency of the injured sphincters and improve the continence of men with PCa. This level includes the awareness of the pelvic floor musculature and the coordination of the contraction-relaxation process to improve the control and the quality of the muscle contraction. Specific attention is given to the muscles of the deep plane of the pelvic floor [5, 24, 25].

To facilitate the perception of the muscles of the pelvic floor, electrotherapy is often used. This technique beyond to guide the patient to correct the contraction of muscles, depending on the type of electrical current, it also can be used other responses. Two types of electrodes can be used in the electrotherapy; internal (anal) and external electrodes [20-26].

In the case of functional electrical stimulation, which is an alternating current of low frequency, it generates muscle contractions and an increase of muscle function. In the pelvic floor muscles, electrode stimulation in the perineal body, the contraction is perceived by the patient and the physiotherapist with the apparent anal contraction. This contraction also acts by stimulating the sacral nerve roots, or specifically the pelvic and pudendal nerves, suppressing the (hyper) detrusor activity [24]

In figure 4, a patient that is undergone electrotherapy with external electrodes is shown. A correct frequency is chosen, following international studies and the intensity of electric current is selected considering the sensibility of the patient.



**Figure 4.** Patient after prostate cancer surgery undergoing electrotherapy

Physiotherapy also assists with postoperative respiratory recovery, early mobilization, lymphoedema prevention, education and garments if required, as well as the later management of pelvic floor re-education, continence advice and lymphoedema treatment if necessary. Men undergoing RP under a general anaesthetic will be off work for about 6 weeks. Moreover, they will stay in hospital for 5-7 days and have a urinary catheter for 2 weeks. The sphincter “valve” has gone and the urine leaks without control, day and night until the patient has learned again to use his muscles of the pelvic floor to regain his continence. Concerning ED, when a man wakes up from a RP he will almost certainly have ED initially. If there is going to be a recovery of erectile function, it may take 18-24 months to occur. Approximately 30% of men will recover erectile function and medication (Viagra or Cialis) will usually boost this recovery. However, physiotherapy procedures could be another suitable option without contraindications. In figure 3 is possible to see a man that has previously been submitted to RP and is undergoing external electrotherapy. In addition, the patient that has learned about the exercises involving the muscles of the pelvic floor can start these exercises immediately just after the surgery or after the catheter removal [20-26, 52, 53].

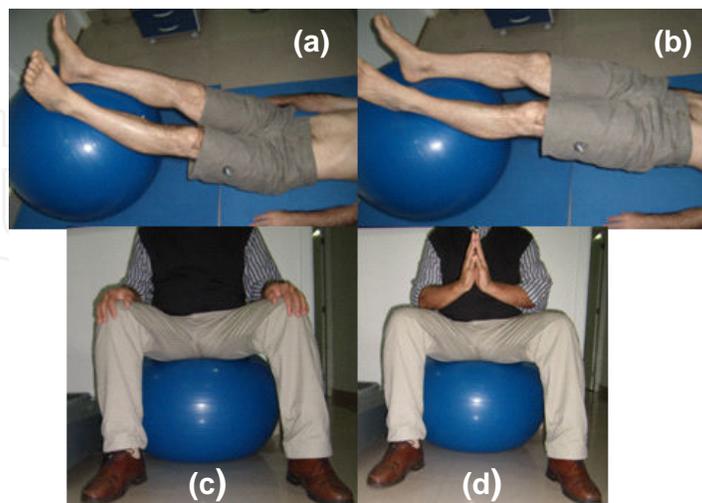
In the figure 5 are shown men doing exercises using a ball to increase the perception of the pelvic floor muscles, as well as to work these muscles.

In figure 5.a, the man relaxed and in 6.b, he has raising the hips and contracting the pelvic floor muscles. In figure 5.c, the man is sitting on the ball to increase the perception of the pelvic floor muscles and in 6.d, the man puts the hands together and begins to lift up the hands and feeling the contraction of the pelvic floor muscles to upward movement.

Beneficial effects of pre- and postoperative pelvic floor re-education are clear, since both the duration and degree of UI after RP can be distinguishably decreased [5, 43, 51].

Physiotherapy has responded to the improved outcomes and patient demand for quality of life improvements by instituting new treatments and education, such as informing about the possible importance of the sunlight in the prevention of the PCa and the equal need to pro-

tect against the harmful effects of the ultraviolet radiation, or about the options of physiotherapy for rehabilitation and re-integration to normal life [5, 6, 8, 9].



**Figure 5.** Men doing exercises with a ball to perception and to work the pelvic floor muscles.

Alternative and complementary techniques have also been considered as an option to be used for treating ED. One of these techniques that is related to the physiotherapy is the acupuncture. Acupuncture is safe and involves the insertion of thin needles into different areas of the body known as acupuncture points. Traditionally, acupuncture has been often used to restore and maintain health through the stimulation of these specific points on the body. As this stimulation could modulate the NO, it is possible to consider that acupuncture might be effective for treating ED. Although, in some studies the acupuncture has been used successfully to treat ED, there is sufficient evidence that acupuncture is an effective intervention for treating ED [55].

Mechanical vacuum devices cause erection by creating a partial vacuum, which draws blood into the penis, engorging and expanding it. The devices have three components. A plastic cylinder, into which the penis is placed; a pump, which draws air out of the cylinder; and an elastic band, which is placed around the base of the penis to maintain the erection after the cylinder is removed and during intercourse by preventing blood from flowing back into the body. One variation of the vacuum device involves a semirigid rubber sheath that is placed on the penis and remains there after erection is attained and during intercourse [27, 28, 50].

In general, physiotherapy management in the area of oncology have relevant contributions to patient care, including: (i) Decreasing length of stay in acute facilities (early discharge planning, outpatient follow up and education, involvement in palliative care facilities and physiotherapy services in home care); (ii) Improving functional capacity (early mobilization, management of complications of surgery, convenient manipulations of the areas submitted to RT and other treatments, as treating lymphoedema and scars); (iii) Improving lymphoedema management that has lead to decreased hospital admissions for cellulitis (a feature of

poorly controlled lymphoedema and/or orientation of the patient) and decreased need for costly and at times uncomfortable pressure garments; (iv) Improving local and general exercise capacity (prevention of loss of body weight and managing the side effects of the disease, medication and surgery); (v) Shortening the period of time of UI after RP; and (vi) Affecting quality of life factors for all patients with cancer and their carers and families. These all provide examples where physiotherapy intervention contributes considerably to the health care provision and demonstrate how the various disciplines allied to medicine are working together to either bring the now healthy individual back to normal life and re-integration to the society, or improve the quality of life of patients that have to live with cancer as a chronic disorder and those that are in the terminal stages of the disease and life [5-7, 43, 53].

## **6. Considerations about the various prostate cancer treatments and their associated side effects**

A number of side effects are associated with the various treatments available for PCa. As it was presented before, associated side effects include ED and UI amongst others, and a number of palliative care treatments and exercises have been proposed to counteract these effects [24, 52, 53]

A very important and unquestionable point is that pelvic floor muscle exercises are relevant to the treatment of ED in patients with PCa that will be submitted to RP. Most physiotherapy treatments for ED focus also on pelvic floor muscles. It is relevant to consider also the arrangement of the muscles at the base of the penis, as well as the other local structures that, with the time without erection, can lead to veno-occlusive ED. This undesirable condition is the result of a sequence of penile morphologic alterations post-RP. The physiotherapist will guide the patient to do exercises for the muscles direct related to the pelvic floor and also to the muscles indirectly related with the pelvis, such as abdominal and gluteal muscles. When they are contracted an increase of the local blood flow to the pelvic region is verified. This process seems to lead to a release of NO to the penis, acting on endothelium vasodilation and dependent on the flow, increasing in oxygen supply to the penile tissue and keeping the erectile tissue healthy [22, 24, 54].

On this same point of view about the treatment of the ED with physiotherapy, the vaccum therapy could also provide oxygen supply generated by negative pressure that distends the corporal sinusoids and increases the blood inflow to the penis. This system reduces apoptosis minimizing fibrosis of the corpora cavernosa which directly influences in the maintaining of the penile length. Differently, the use of the vacuum device (figure 6) for intercourse, the vaccum therapy does not use the ring constrictor, since it would keep in the corpora cavernosa a poorly oxygenated blood. The vaccum therapy could be combined with others therapies for ED, as pelvic floor muscles exercises (kinesiotherapy) and oral therapies (medications) [27, 40, 50].

UI has been also treated with the various exercises (kinesiotherapy) involving the muscles of the pelvic floor in patients submitted to RP. Prior to a pelvic floor muscle exercise program,

an anal assessment is performed to grade the strength, endurance and speed of the anal sphincter and the puborectalis muscle. Pelvic floor muscle exercises are individually taught to ensure that they are being performed correctly [52],

In consequence, a number of pertinent considerations arise from the treatments and their associated side effects, which can related directly to personal circumstances and situations, clinical conditions after treatment or laboratory determinations (PSA) and medications/procedures used after treatment [40, 41, 46, 47].



**(1)Suction syringe, (2) Plexiglass cylinder, (3) Barometer, (4) Sealing ring of silicone cylinder**

**Figure 6.** A model of a vacuum device

Personal situations related with the possible treatments for PCa must be considered, as bladder irritation is common after RT, bowel complications might occur in the long-term and have high incidence during external beam RT, ED can be early in the surgery in comparison with RT, and penile shortening or fibrosis might occur after RP [6, 14].

Clinical conditions after the RP, such as pelvic pain, is common mainly in young men, UI will occur in the post operative period, erectile functioning might return slowly over years after the surgery. All these must be considered and must be explained to the patient and his family [6, 14].

The decline of the quality of the sexual activity can lead to a complicated pattern of change in quality of life and also negatively affect the psychosocial wellbeing of men and of the couple [6, 14].

Concerning the laboratory determinations as well as the medications used after the RP, it is important to consider that phosphodiesterase-5 inhibitors have limited actions in the cases of ED and the velocity is a more reliable indicator of recurrence than an isolated PSA meas-

urement. When the available procedures to minimize the clinical complications of the RP or of the RT are considered, it is highly relevant to emphasize that the decrease of the appearance of complications occurs in patients that have undergone physiotherapy before the RP and the improvement of the symptoms is observed due to the procedures of the physiotherapy just after the RP [6, 14].

Due to the high occurrence of the PCa in the world, the high cost involved in the treatment and its impact in the quality of life of the patients with this disease, considerations about the different kinds of treatment as well as the possible complications of the treatments available are desirable [6, 14].

In addition, the questions associated with the personal situations related with the possible treatments for PCa would be relevant for a better understanding of the clinical situations of each patient [6, 14].

Finally, the knowledge of the patient about his situation as well as the involvement of the family and partner must be strongly considered. Moreover, it is also important to explain and present all the possibilities involving the treatment of the PCa. In addition, it is highly desired that all the modalities of procedures that are available to aid in the prevention of undesirable clinical conditions. Furthermore, it is suggested that is necessary to consider the techniques related to the physiotherapy before and after the treatment of choice to the PCa.

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