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Research Article

Cancer and Exercising - What Should be Considered?

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Abstract

Background: With the growing advances in the field of oncology, more effective treatments have been implemented that provide more chances of cure patients. Cachexia and asthenia commonly coexist in the course of treatment and can persist for months or years. In this context, we propose some physical exercises correlating them to the patient's clinical status, based on the Ecog scale.

Discussion: We can make some considerations about the data described in cancer patients and adapt them to other patients.

Conclusion: We believe that the benefits of physical exercise practice in those patients undergoing cancer treatment are unquestionable, as well as in cancer survivors.

Keywords: Cancer; Fatigue; Physical Exercise

Introduction

The crescent advance in oncology, new therapies have been implemented effective treatments, providing more chances of cure and survival.

The therapies can cause side effects, affecting the quality of life and the prognosis. Factors contribute to the asthenia, such as anemia, de autonomy, and muscular abnormalities. It's necessary a multidisciplinary approach with combined therapy to control the cancer cachexia and the asthenia [1].

According to NCCN the fatigue related to the cancer occurs in 50-90% of the patients and can persist for months or years after the oncologic treatment 1 [2]. Clinical factors that arise in the course of the treatment, such as anemia, hypothyroidism, metabolic disorders, depression, pain, among others, bone health issues must be controlled in order to evaluate non-drug therapies that can contribute to an improvement of the asthenic condition. It is a common significant loss of upper limb mobility and a major loss of muscular strength and muscle mass, compromising life satisfaction and quality of life [2].

Soriano-Maldonado and cols considered that muscular strength during treatment has been reported to be 25% lower in lower extremities and 12% to 16% lower in upper extremities compared to healthy individuals, and similar trends seem to occur regarding cardiorespiratory fitness and upper limb function and mobility. It is important to note that this tendency might worsen in the absence of physical exercise following treatment [3].

In this scenario, Alves cols demonstrated that the physical training could be an effective adjuvant therapy to neutralize the cachexia of the cancer, even though its molecular mechanism is poorly understood [4]. Sporn., *et al*. point out to physical activity as a modality of rehabilitation for the cancer survivors in the last 20 years, bringing many benefits to the health including longer survival free from the illness, muscle strength, aerobic capacity, and quality of life [5].

Physical activity in cancer patients

The physical exercise promotes improvements in the ventilation and pulmonary perfusion as well as the increase of the cardiac reserve. Thus, an improvement of the oxygen transportation capacity is noted, reducing the fatigue, promoting better functional autonomy. The exercise strengthens the organism improving its response to the impact of the illness and the collateral effects of the treatment. Exercise has also been shown to reduce the risk of cancer. Although epidemiological studies of exercise and its impact have bias, data strongly suggest exercise to be preventive for cancer. Concerning a potential role for exercise in cancer prognosis and therapy, physical activity has been reported to be associated with a lowered risk of disease recurrence (breast cancer and colorectal cancer [6].

Exercise in humans is associated with a range of physiological changes, the magnitude of which is influenced by the intensity and duration of the exercise. Thus, there is an increase in cardiac output to meet oxygen demands, and a dramatic change in the pattern of blood flow. The metabolic rate goes up, and glucose consumption as well as output is increased, as is lactate levels due to anaerobic metabolism in muscle cells. Moreover, the endocrine system plays a key role in integrating the physiological responses both during rest and exercise [7].

However, physical activity in oncologic patients has to consider in which moment we are evaluating. It can happen during or after the end of treatment. Roger Hilfiker, et cols describe 'during' or 'after' cancer treatment Studies including those patients receiving chemotherapy or radiotherapy as the initial cancer treatment or as treatment in the presence of metastasis or cancer recurrence were classified as 'during', while those studies including patients currently not on chemotherapy or radiotherapy were defined as 'after'. Studies including both types of patients were classified according to the majority of patients. Studies including patients receiving androgen suppression therapy without chemotherapy or radiotherapy were defined as 'after' [6]. The evaluation of the moment of treatment in which the patient is, is important because it directs us to what type of exercise will be more indicated and tolerated, taking into consideration the side effects of oncologic therapy and the patient's performance status in that period of treatment.

Physical activity is beneficial in preventing some cancers, and in decreasing recurrence, increasing survival, and improving quality of life for cancer patients. Multiple biological pathways may be involved, including a reduction in inflammation and an enhancement of anti-tumour immunity. Neither of the aforementioned mechanisms has been studied in adequate detail to gain a full understanding of their role in cancer prevention and therapy with respect to exercise. Inflammatory mediators have many physiological, metabolic and immunological roles and are produced in many tissues. Numerous cell types of the innate and adaptive immune system work in partnership to generate anti-tumour host responses. Additional studies will be needed to determine a) Which inflammatory mediators and anti-tumour immune mechanisms are most sensitive to exercise, b) The dose, duration and frequency of exercise needed to achieve anti-inflammatory or antitumor effects, and c) The timing of sample collection with respect to the exercise bout to adequately capture appropriate levels of anti-inflammatory mediators and antitumor immune mechanisms [7].

Animal studies demonstrate an anti-inflammatory role of exercise via multiple pathways. Exercise normalized the elevated levels of TNF-α in soluble TNF receptor knock-out mice. Data suggest that TNF-alpha-induced insulin resistance can be regulated by a single exercise by normalizing TNF-alpha expression [8].

The ranking of the effectiveness of the different types of interventions, which was possible due to the Bayesian approach, may help healthcare professionals (eg, oncologists, nurses, physiotherapists, family practitioners) and patients with cancer in their shared clinical decision making process. For example, the preferences of the patient, contraindications, the availability and the costs of the interventions may influence their decision. Our ranked interventions help patients and practitioners prioritize

evidence-based interventions during and after treatment. Healthcare professionals may offer their patients a variety of exercises or other non-pharmaceutical interventions, such as relaxation, yoga, CBT combined with physical activity or resistance or aerobic training [6].

After cancer treatment, however, time invested in relaxation sessions is less effective and more time should be spent with physical activity enhancing interventions. Yoga, on the other hand, could be beneficial both during and after cancer treatment. The same applies for aerobic, resistance and combined aerobic–resistance training, be it on a somewhat lower effect size level [6].

Among the various benefits of the physical exercise in patients with cancer we can still highlight the action in the cardiotoxicity. According to Haykowsky., *et al*. in his objective-analysis it is demonstrated that the physical exercise of the aerobic type of strong intensity had a better efficacy compared to the one of moderate intensity in patients with cardiac insufficiency [9].

Different working mechanisms may explain the effectiveness of the interventions cited. Active exercises (eg, resistance training, aerobic training, dance, yoga, etc) may counteract the decreased level of activity during or after cancer treatment, and hence improve physical capacity. Furthermore, higher physical activity levels may also have a beneficial effect on mental health [6].

Methodology

Physical exercise is defined by physical activity in a planned and structured way aimed at the objective of improvement or maintenance of physical and mental health [10]. Every physical exercise is a physical activity. In this context we propose some physical exercises correlating them to the clinical status of the patient during his cancer treatment, based on the ECOG scale. In order to improve the evaluation and perception of the effort we use the OMNI-RES scale [11].

Physical exercise and the ECOG scale

Patients in bed and in ECOG 4 are restricted to the bed, with muscular atrophy most of the way and rigidity in the articulations. Due to the lack of autonomy and the cachexia the passive exercise is indicated aimed at the improvement of the elastic muscular activities, mobilization of the osteoarticular system and connective tissues. Those individuals in ECOG 3 finding themselves with special needs or hospitalized that can present muscular atrophy, rigidity in the articulations and little autonomy will benefit with the active stretching aimed at the improvement of the muscular elastic activities and of the osteoarticular system. Patients in ECOG 2 present some degree of muscular atrophy, light rigidity in the articulations. They present autonomy for self-care and the active exercises of mobility improve the muscular elastic activities, better mobilization of the osteoarticular system and connective tissues, promoting better well-being. In the ECOG 1 patients find themselves autonomous and able for light works and exercises of strength training of light to moderate intensity, respecting the individual limitations. We aim at the maintenance and strength gain and bigger osteoarticular agility. In those individuals in ECOG 0 we suggest mixed activities of resistance and force from moderate to severe respecting the limitations, physical conditioning, and individual preferences [12,13].

In the table below we present some suggestions that can be applied according to the ECOG of the patient.

Exercise suggestions distributed according to ECOG

Type of exercise	Exercise	Description	Intensity	ECOG
Passive Streching	Hip flexion lying limbs flexed	DD*, the patient with the help of a professional flex both legs towards the thorax, applying light pressure	Very Light	4
Passive Streching	Unilateral lying hip flexion extended limb	DD, the patient with the help of a professional raises one of the legs extended towards the thorax to the point that the patient does not lose contact of the hip with the surface	Very Light	4
Passive Streching	Flexion and External Rotation of the Arm	DD, the patient with the help of the professional will perform a flexion accompanied by external rotation of the arm stretching pectoral stimulate the ROM** of the glenohumeral joint.	Very Light	4
Passive Streching	Flexion, Extension and Rotation of the Trunk	DD, the patient with the help of a professional will perform the movements of extension, flexion, and rotation of the trunk to stimulate the stretching of the musculature of the chain.	Very Light	4

Type of exercise	Exercise	Description	Intensity	ECOG
Active Stretching	Pelvic Elevation Isometrics	DD, with arms parallel to the trunk, the patient raises the hips relaxing the entire region of the abdomen	Light	3
Active Stretching	Lying hip flexion	DD, the patient flexes both legs toward the chest and hugs them	Light	3
Active Stretching	Flexion with External Arm Rotation	supine position, the patient will perform a flexion accompanied by external rotation of the arm to stretch the pectoral, stimulating rom at glenohumeral joint.	Light	3
Active Stretching	Flexion, Extension and Rotation of the Trunk	DD, the patient with the help of a professional will perform the movements of extension, flexion, and rotation of the trunk to stimulate the stretching of the posterior (flexion) and anterior (extension) chain musculature, and the thoracic ROM (rotation).	Light	3
Type of exercise	**Exercise**	**Description**	**Intensity**	**ECOG**
Mobility	Standing ankle mobility	Standing with one foot in front and arms extended against the wall, the patient projects the knee towards the wall without removing the heel from the floor	Light	2
Mobility	Thoracic flexion and extension in four supports	Leaning on the ground with four supports, the patient will perform the extension movement followed by the flexion movement of the trunk to stimulate the rom of the vertebrae.	Light	2
Mobility	'Shoulders' Mobility supported on the wall	Supported with his back against the wall, the patient will slide his arms, with the back of the hand and elbows against the wall, to stimulate the ROM of the glenohumeral joint, and to stretch the trunk muscles.	Light	2
Mobility	Thoracic Mobility with Rotation	On a half kneeling basis and leaning against the wall on the side of the supported leg, the patient will extend the arms forward and rotate the trunk, maintaining contact with the wall, to stimulate the thoracic ROM and stretch the chest muscles.	Light	2
Type of exercise	**Exercise**	**Description**	**Intensity**	**ECOG**
Strength Training	Sitting on and getting up from the seat	With the feet parallel to each other, the patient sits on the bench, cadencing the speed until sitting on the bench and when standing up the patient applies force on the heel without removing the foot from the floor until standing upright	Moderate	1
Strength Training	Standing plantar flexion	Standing next to a support, the patient stands on the "tip" of the foot and then returns to the starting position	Moderate	1
Strength Training	Supported push-up	Standing close to a wall, the patient will perform the arm flexion with support on the wall.	Moderate	1
Strength Training	Wall Plank	Standing away from the wall and with arms extended, the patient will lean on the wall where he or she supports the body for 15 seconds and returns to foot balance.	Moderate	1
Type of exercise		**Description**	**Intensity**	**ECOG**
Strength Training		according to physical limitations	Moderate	0

Table 1

* DD = Dorsal Decubitus

**ROM = Range of Motion

Discussion

Physical activity is recognized for its health benefits to individuals and its benefits are widely validated. However, in this study we sought to identify these benefits in patients with cancer and in cancer survivors. Among the main benefits pointed out by Silvia Chutz., *et al*. in their systematic review is the increase muscle strength, promoted by the practice of resistance exercises in combination with other types of exercises. Physical activity promotes a decrease in fatigue, improving quality of life, and improves psychosocial context, promoting an increase in leisure time [14]. It is estimated that aerobic and mixed-mode exercises cause a reduction in fatigue in cancer survivors [15].

The perception of exertion (PE) is defined by Robertson and Noble as the subjective intensity of effort, tension, discomfort and/or fatigue that are experienced during aerobic and strength physical exercises. Its applicability is quite large, and its main point is the measurement of physical exertion [16].

Kinesiotherapy is presented as a form of alternative therapy to reduce the side effects of cancer-related fatigue. Studies that approached kinesiotherapy as a resource in the treatment were reviewed, concluding that it promotes improvement in several physiological aspects in patients, such as cardiopulmonary capacity, muscle endurance, range of motion, pain reduction, and fat percentage. They reinforce that the physiological parameters are the ones that contributed the most to the reduction in fatigue in the patients. They suggest that exercise protocols can be included as a crucial part of rehabilitation programs for cancer survivors and patients during antineoplastic treatments [17].

The study by Hagstrom., *et al*. provides evidence for resistance training alone and the improvement of perceived fatigue in breast cancer survivors [16]. However, we can do some considerations about the data described and adapt them to other cancer patients, respecting their limitations, sequelae, and clinical status. We should also consider individual preferences. Such studies contribute to the growing body of evidence supporting the application of resistance training as a safe and effective adjunctive treatment that we believe can be used widely in the recovery and follow-up of cancer patients. The incorporation of exercise will provide improvement in depressive symptoms, anxiety reduction, and overall well-being [18].

However, data are needed in other cancers, and not much is known in terms of the optimal timing and type of activity. Moreover, the mechanism by which exercise impacts on cancer risk and prognosis is largely unknown.

We have to consider fatigue itself as a barrier to exercise among patients with cancer and survivors. Thus, appropriate strategies should be tailored to the individual needs and abilities of patients and re-evaluated regularly [6].

Conclusion

There is no doubt regarding the benefits of physical exercise on patients in oncologic treatment. We presented exercise suggestions in accordance with the ECOG classification as a means to improve fatigue symptoms in these individuals. However, given the scarcity of studies in the topic, we have faced a little information scenario which limited our work.

Funding and Conflict of Interest Statements

- We have no conflict of interest for the topic, and since it is an article based on a literature review and, from there, a proposal of conduct for the patients, there was no funding, and we used our own resources.
- Regarding the data for the elaboration, the articles consulted are described in the bibliographical references, and we can provide them in their entirety.

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