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Minireview

Effects of Exercise on Circulating Tumor Cells among Breast Cancer Patients

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Introduction

Between 2020 and 2022, with the advent of the pandemic and the restrictions imposed by governments around the world, the diagnosis and treatment of cancer were negatively affected, as the pandemic caused a reduction in access to health care due to the closure of health facilities to reduce exposure to COVID-19, this has resulted in delays in the diagnosis and treatment of cancer, which may have caused, in the short term, difficulty in diagnosing cancer in the early stages and increased incidence of cancer, followed by an increase in late-stage disease and, ultimately, increased mortality [1]. According Globocan Angola has a total population of about 32,866,268 people, where the number of new cases of cancer is 20,327 cases and the mortality rate is 12,599 deaths, it is estimated that the prevalence of cancer in the last 5 years was around 40,752 cases [2]. Data from IACC (2012 -2016) revealed that from 5609 new cases, most were males, 9.7% were in children below the age of 15 years. The five most common cancers were breast (21.4%), cervix (16.8%), prostate (7.1%), non-Hodgkin lymphoma (4.5%) and Kaposi sarcoma (4.3%), looking to these data we can have a picture of how important the prevention, screening and early diagnosis and a fitness program is to improve the quality of life (QOFL) of patients [3].

Over the past decade, a large body of epidemiological evidence has demonstrated an inverse association between prediagnosis and postdiagnosis recreational physical activity with mortality among BC patients, but physical activity has been consistently associated with reduced breast cancer mortality [4]. Breast Cancer is the second most incident cancer in Angola and the third death cause by cancer [5].

Although Angola has a National Institute for the Fight against Cancer, with several programs for diagnosis, treatment, monitoring and guidance, both in Angola and in some African countries, not much is known about programs that include changing the practice of exercises in the fight against cancer much less studies that evaluate the effect of exercise on circulating tumor cells among patients with breast cancer, in a global way, we decided to carry out the present mini-review on the topic with the aim of making an analytical approach to the related topic to the effect of exercise on circulating tumor cells among breast cancer patients, looking at what has already been described on the subject, to stimulate the possibility of including programs with this model in the fight against breast cancer.

Methodology

A mini review was carried out using a documental bibliographic review technique based on the experience obtained in the provision of medical and medical assistance, experienced in the clinical practice of researchers who are Angolan professionals and work in Angola. This article emerged from critical thinking based on the current situation of cancer programs, developed in Angola and in the world in general, reflecting on the effect of exercise on circulating tumor cells among breast cancer patients. A total of 24 articles published in indexed international scientific journals, and data published on websites of two international organizations were included in this mini review. For the search criteria, we included information such as cancer, cellular response, circulant tumor cells, physical exercise and Angola.

Exercise and Circulant Tumor Cells Among Breast Cancer Patients

Recent evidence-informed exercise guidelines have been released for cancer survivors [3], with strong evidence supporting the benefits for fatigue and physical function, moderate evidence on the benefits for bone health, insufficient evidence on the benefits for pain and beneficial effects of moderate intensity exercise are shown to occur both during [4-8] and after treatment [8-10] and include improvements in treatment relates physical [11] and psychological [12] side effects. The guidelines are based primarily on randomized controlled trials in BC.

Indeed, the guidelines acknowledge that individuals with bone fragility may not be able to adequately or safely engage in the levels of exercise they recommend. Thus, more research is required to elucidate the specific disease, treatment and personal factors that may limit exercise tolerance in survivors, and the modifications and adaptations to programming necessary for these individuals to engage safely in, and benefit from exercise.

Circulating tumor cells (CTCs) are a real-time source of biomarkers, these cells have shown promise in facilitating the detection and monitoring of responders and non-responder patients. It has been proposed that the identification and analysis of CTCs would facilitate investigations to understand intrinsic tumor features and characteristics of patients or non-responders so that individualized treatment strategies can be applied. Use of CTC counts has been approved by the US Food and Drug Administration as a prognostic tool for metastatic prostate, colon, and breast cancers [13,14].

Shear flow characteristics may affect CTC viability and alter intracellular characteristics of CTCs [15], higher forces and longer durations of shear stress exposure may retard growth rates of CTCs and attenuate metastatic potential [16,17]. Exercise induces substantial increases in vascular shear stress [18,19], which may alter CTCs in patients with colon cancer for example. This direct effect of exercise on CTCs may explain, in part, the biological mechanism through which exercise reduces disease recurrence.

There is evidence that CTCs have prognostic value in both metastatic and early breast cancer. In the context of metastatic breast cancer, high CTC counts are associated with poorer disease prognosis, and studies have shown that ~44% of patients with metastatic TNBC (Triple negative Breast Cancer) have ≥ 5 CTCs per 7.5 mL of blood (20). In the context of early breast cancer, presence of CTCs at baseline prior to adjuvant chemotherapy, as well as the persistence of CTCs following adjuvant chemotherapy, was significantly associated with poorer disease-free survival and worse overall survival in patients with early BC [21-23]. Lucci et al. [22] demonstrated that the detection of at least one CTC was prognostic of poorer progression-free survival among chemonaive patients with early-stage BC. Additional studies have demonstrated that the sustained presence of CTCs following neoadjuvant chemotherapy is associated with resistance to therapy (2021), and that persistent detection of CTCs in BC patients following adjuvant therapy predicts poorer disease-free survival and overall survival. Recent study showed that the identification of patients with CTC cluster may help to pinpoint high risk patients and to render them eligible for anti-cluster treatments very early on, aiming to reduce the metastatic ability of cancer cells [24-25]. Brown and colleagues showed that exercise can reduce CTCs among patients with colon cancer and have a direct effect on CTCs and indirect effects through changes in host factors. Changes in host factors are correlated with changes in CTCs [26].

Final considerations

In summary, exercise may lower CTCs in BC patients, moderate to vigorous physical activity has been found to be associated with a decreased risk of BC. The risk for developing BC is doubled in postmenopausal women with the highest Body Mass Index (BMI), highest caloric intake, and physical inactivity when compared to physically active women with lower caloric intake and BMI, CTCs are prognostic of disease recurrence among cancer patients. The pathways through which physical activity may alter disease outcomes are unknown but may be mediated by changes in CTCs. We believe that physical activity may reduce the risk of diagnosis metastatic disease, recurrence and mortality. More research on effects of physical exercise on CTCs are needed to understand the mechanisms that can improve treatment strategies for BC patients benefits.

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