Exercise and cancer

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“Do not stand still
on the edge of the road
do not freeze the joy
don't love with reluctance
don't save you now
or ever”.

From ancient Greece it has been linked physical activity with a healthy life. It seems obvious that people who perform physical activity are healthier than the sedentary; however, is there an association between physical activity and reduced risk of cancer? We will try to justify this association with the evidence to date.

The occurrence of hereditary cancer is low, being around 10%, is for that reason that many cancer patients do not have a family history related to their disease, which is presented as an isolated or sporadic fact. The majority of neoplasms are the product of mutations acquired during life, so the style of life has an important influence by exposure to factors favoring these mutations which can lead to deregulation of the cell cycle and carcinogenesis of the involved tissue. It seems that physical activity is one of the behaviors in the lifestyle that could have more impact on reducing the risk of cancer. In recent years have been made several inquiries seeking a robust association between the influence of physical activity on reducing risk of developing a malignant neoplasm. It is not easy to investigate the consequences of behavior on the development of cancer, because
physical activity is not a standard objective measure and cancer is a multifactorial disease where many elements are plotting to cause the disease. It is for this reason that the study of life style has been systematized using different scales intended to evaluate the influence of different factors on the incidence of various types of cancer.

A review on cancer and physical activity performed by JC Brown and colleagues, evaluated different cohort and case-control studies, who found a reduction in the risk of breast cancer with exercise by 20% and 30%, respectively. It was also evidenced a 21% reduction of colon cancer risk; however, a specific reduction in rectal cancer was not found with exercise. Endometrial cancer reduction was 20%, as well as 23-38% reduction in lung cancer and 19-21% of ovarian cancer. The consensus is that exercise significantly reduces the risk of colon, breast and endometrial cancer, but the association with other types of cancer is more weakly.

A study by TA Thompson et al. assessed the association between cancer mortality and overall mortality with the cancer prevention guidelines proposed by the American Cancer Society, including: weight control, physical activity, moderate consumption of alcohol and diet. This research included 65,838 postmenopausal women belonging to the WHI study (Women’s Health Initiative) evaluated in 12 years. It was noted that patients who met the guidelines had a 17% risk less of developing any type of cancer (HR: 0.83), 22% less for breast cancer and 52% lower for colorectal cancer. This group of patients also presented a 27% lower all-cause mortality and 20% less cancer mortality. The interesting thing about this study is that physical activity “was the health behavior most strongly associated with lower all-cause mortality”. Based on these findings can be considered the exercise as the most important lifestyle related behavior in cancer prevention.

How to explain the decrease in the risk of cancer with exercise? It has been proposed different mechanisms:

1. Reduced levels of estrogen and testosterone, increase metabolism of these hormones and liver production of sex hormone binding globulin (SHBG), which reduces the sex steroids-free fraction. This effect would have impact mainly on hormone-dependent malignancies such as breast and endometrial cancer.

2. The increased levels of insulin and IGF-1 (Insuline-like Growth Factor 1) have been associated with cell growth and inhibition of apoptosis. On the contrary, exercise improves insulin sensitivity and lowers levels of insulin and IGF-1. It has been estimated in recent years the production of myokines by the muscle tissue increase sensitivity to insulin, favoring lipolysis and generating a hypermetabolic state. The secretion of myokines makes that currently the muscle should be considered as an important endocrine organ.

3. Inflammation promotes the growth of damaged cells and promotes tumor development; markers of inflammation such as IL-6, TNF-α and C-reactive protein have been associated with an increased risk of cancer. Exercise reduces the production of these inflammatory cytokines, so it would have an anti-inflammatory effect.

4. Effects on the immune system: during the exercise there is a transient increase in the population of T cells, Natural Killer cells and neutrophils, constant exercise maintains this elevation, also improving the number and function of macrophages. A competent immune system eliminates the damaged cells whose survival is an altered cell growth.

5. The exercise works as an antioxidant because it improves the removal of oxygen free radicals, decreasing oxidative stress that encourages carcinogenesis. Vasodilation and increased cardiac frequency generated by physical activity, produces adequate tissue irrigation and removal of the waste product of the cell metabolism in a timely manner. The exercise prevents the accumulation of mutations in DNA that occurs normally with
aging probably through activation of mitochondrial control systems, reduces oxidative damage at the cellular level, prevent the shortening of Telomeres, which are responsible for ensuring an adequate cell mitosis, decreases hypomethylation of DNA and stimulates the expression of repair genes of DNA such as BRCA.

While exercise impressed to be the most important preventive measure, it is not the only. The World Cancer Research Fund and American Institute of Cancer Research recommendations\(^6\) advised, in addition to exercise regularly, maintain a proper body weight, limit consumption of high density foods, eat mostly plant foods, and limit the intake of animal foods, alcohol and salt consumption. They also recommended achieving the nutritional requirements through diet, not with nutritional supplements, and insisting on exclusive breastfeeding up to 6 months of age. The implementation of these recommendations translates into a decrease in the morbidity and mortality from all causes. The exercise should not necessarily be intense because the healthy effect occurs with moderate activity such as walking. It is necessary to incorporate more regular physical activity to daily routine as climbing stairs, dancing or running and do activities walking or use the bicycle as a transport. The best exercise is definitely one that excited us because invites to enjoy it often.

Definitely, within the preventive measures to avoid the increased incidence of cancer, among other illnesses associated with the development and the city lifestyle, it is mainly physical activity on a regular basis because of the advantages which have for reducing the risk of developing cancer and many other advantages related to cardiovascular, neurological and mental benefits that will give us more and best years of life.
