Pros and Cons of Ascorbic Acid (Vitamin C) Use In Cancers

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For decades, ascorbic acid (aka vitamin C), has been popularly prescribed by alternative and complementary health care practitioners and used by individuals or patients with various health conditions, including cancer progression [1], due to its renowned antioxidant property [2], which consists to neutralize free radicals such as superoxide (H2O2) and hydroxyl (OH) radicals, as well as its capacity to protect and repair normal cells that are damaged by chemotherapy or radiation therapy [3]. Surprisingly, the mechanism of anti-tumor effect of ascorbic acid, especially used at high dose, has been proposed to be mediated by generation of H2O2 and secondary metabolite[4].

Interestingly, a number of studies have reported the benefits of ascorbic acid in preventing and treating cancers [5]. Thereby, in some preclinical studies led in-vitro and in-vivo, ascorbic acid induced tumor cells apoptosis and even enhanced the anti-tumor effects of chemotherapy or radiation therapy [6-7], acting then as a potentially good therapeutic adjuvant. Conversely, evidence from other studies and randomized trials[8] suggested that ascorbic acid during chemotherapy or radiation therapy may protect tumor cells and reduce the treatment efficacy.

Besides, a meta-analysis published this year and which aimed to associate dietary ascorbic acid supplement intake and survival in breast cancer patients, showed that the relative risk (RR) of breast cancer-specific mortality can be lowered with 100 mg intake per day of ascorbic acid, [9]. However, it is important to point out the fact that the experimental conditions of the studies used in this meta-analysis differed notably in terms of dosage, formulation and administration type and schedule, causing these confounders difficult to control. Besides, it is noteworthy that in sub-analysis of Women’s Health Initiative (WHI) study, dietary intake of ascorbic acid was not associated with a reduction in ovarian cancer risk [10].

Therefore, the challenging issues still concern: (i) which dose (high or low) and administration setting are really beneficial for a patient suffering from cancer? (ii) which cancer is prone to ascorbic acid therapy based on efficacy/toxicity risk ratio? (iii) which are the fully clear molecular mechanisms mediated by ascorbic acid in cancers?; (iv) which are the benefits or risks of using nano encapsulated ascorbic acid, considering the systemic bioavailability of such compound?; (v) which are the benefits or risks of combining (nano-)ascorbic acid with (nano-) anti-cancer agents (chemical drugs and/or bio therapeutics)?

In light of these few observations from inconsistent studies, it is difficult to state that ascorbic acid is an anti-cancer agent, and many issues still need to be accurately and promptly addressed first from a holistic point of view before prescribing it in a personalized manner. Ongoing studies certainly provide new interesting insights about ascorbic acid effects on cancers.

References