Vitamin C and K in Prostate Cancer

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Reference: Tareen B, et.al. A 12 Week, Open Label, Phase I/IIa Study Using Apatone® for the Treatment of Prostate Cancer Patients Who Have Failed Standard Therapy. International Journal of Medical Sciences. ISSN 1449-1907, 2008 5(2):62-67.

Design: Human Trial

Trial information: The use of Vitamin C and Vitamin "K-3" have been written about and postulated about in the treatment of cancer for many years. In years of teaching IV therapy, we used to commonly teach an IV Vitamin C with IV Vitamin K-3 protocol for cancer patients. The basis of this will be described below, but this practice (in the IV setting) has largely been abandoned in recent years due to frequent side effects during the IV such as temporary pain.

To clarify the agents used in this trial it is important to look at the forms of Vitamin K commonly known as Vitamins K1, 2 & 3.

Phylloquinone, also referred to as vitamin K1, is a compound present in all photosynthetic plants and is the primary dietary source of vitamin K.

Menaquinones are the other category of vitamin K present in the food supply. Menaquinones are often referred to as Vitamin K2, which is somewhat misleading given that all menaquinones are not alike in their origin or their function. Menaquinones are primarily of bacterial origin, and differ in structure from phylloquinone in their 3-substituted lipophilic side chain. The major menaquinones contain 4–10 repeating isoprenoid units indicated by MK-4 to MK-10; forms up to 13 isoprenoid groups have been identified.

Menadione is referred to as Vitamin K3. It is an organic compound and an analog of 1, 4-naphthoquinone with a methyl group in the 2-position.

Vitamins K1 and K2 are generally antioxidant and K3 generally pro-oxidant. Vitamin K3 has been used in oncology research as mentioned in this paper and shown to be chemo sensitizing and as having other positive potential effects in many cancer cell lines.

The use of Vitamin C with Vitamin K3 has been used in cell culture studies as well as in an oral formulation in animal studies.

The purpose of this human trial was to evaluate the safety and efficacy of oral Apatone® (Vitamin C and Vitamin K3) administration in the treatment of prostate cancer in patients who failed standard therapy.

Prostate Specific Antigen (PSA) levels, PSA velocity (PSAV) and PSA doubling times (PSADT) were calculated before and during treatment at 6 week intervals.

All patients were treated with Vitamin C: K3 (5,000 mg. of VC and 50 mg. of VK3 each day, Apatone) for a total of 12 weeks. Apatone in capsular form (500 mg VC as ascorbate and 5mg VK3 as bisulfite) at a dose of 2 capsules on arising, then 1 capsule every two hours for six doses followed by two capsules at bedtime for a total of ten capsules per day.

Results of the trial: (As a note – successful outcome (using these data) in prostate cancer is considered a PSADT increase and a PSAV decrease.) At the conclusion of the 12 week treatment period, PSAV decreased and PSADT increased in 13 of 17 patients ($p \leq 0.05$). There were no dose-limiting adverse effects. Of the 15 patients who continued on Apatone after 12 weeks, only 1 death occurred after 14 months of treatment.

Practice Implications: Why is a paper from 2008 being reviewed now? I could not find a recent review of the C-K3 study and due to the advent of social media and having this idea being spoken about on wide spread social media posts, I thought that a review of the actual paper looking at human response (as mentioned there are other in vitro data) would be a good addition to this discussion.

Oral therapies in patients with cancer are always popular as they can be administered at home and are often more economical than intravenous therapies. As mentioned previously, intravenous therapy trainings (this author participated in) taught an IV Vitamin C with Vitamin K3 (C-K3) as a potential cancer therapy. As also stated earlier, this practice has largely been abandoned due to side effects including transient severe pain as well as hematologic effects. Although intravenous Vitamin C is still taught and used in oncology, the C-K3 IV is not.

Of interest is that the theory behind C-K3 is not a bad theory at all. The study mentioned shows a significant potential for this theory to be employed using an oral therapy.

Summary of oral C-K3:

- Oral C-K3 given in multiple doses during the day (to maximize pharmacokinetics) as listed in the study and noted above is likely superior to bolus dosing.
- It is likely beneficial in chemotherapy sensitization for many chemotherapy agents.
- In prostate cancer patients in a small trial Tareen et.al. showed significant safety and efficacy.
- The use of oral C-K3 as outlined in this paper is worth consideration in the adjunctive treatment of patients with cancer.