Transformative Medicine (T-Med)

Volume 1 | Number 3 Article 6

September 2022

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Recommended Citation

Rainone GJ, Han TJ, Rahim M, Pirolli GJ, Popa A, Thimmapuram J. Vitamin C Deficiency in a Food Insecure Patient: A Rare Case Report. *Transformative Medicine (T-Med)*. 2022; 1(3):64-66. doi: https://doi.org/10.54299/tmed/dhoy5611.

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Cover Page Footnote

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Vitamin C Deficiency in a Food Insecure Patient: A Rare Case Report

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Published September, 2022

INTRODUCTION

Scurvy is the result of chronic Vitamin C deficiency. Vitamin C, also known as ascorbic acid, is an important cofactor for the synthesis of collagen which aids multiple enzymes in the hydroxylation of proline and lysine residues leading to the formation of the triple helical structure of collagen–a vital structural protein found in connective tissue. By hindering collagen synthesis, lack of Vitamin C can result in bleeding, bruising, poor wound healing, and loss of teeth[1-3]. Many cases of scurvy occurred during the 18th and 19th centuries in sailors voyaging the sea without access to fresh fruits and vegetables—a common source of ascorbic acid. In the modern United States, knowledge of this disease and vitamin fortification of water supplies and foods have prevented many cases of scurvy[3-5]. Although it is a rare disease in the adult population, scurvy still finds its way into modern society in instances of food insecurity, lack of access to adequate medical care, and other social determinants of health[5-7]. The prevalence of scurvy in the United States is roughly 7.1%, according to the literature and has grown in recent years[8]. It has become a concern in the public health sphere, especially as the number of unhoused individuals has increased, and proportionately, the number of people with inadequate access to healthy foods. In this case report, we describe an adult homeless patient presenting with symptoms of vitamin C deficiency.

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Conflicting Interests: The authors have no conflicts of interest to declare.

Acknowledgements: We would like to acknowledge the WellSpan Health York Hospital Department of Internal Medicine for their help in putting together this case report.

CASE PRESENTATION

A 53-year-old male with a past medical history of a left-sided cerebrovascular accident with right hemiparesis and a 15-pack-year smoking history presented to the emergency department with a right knee hemarthrosis secondary to a mechanical fall. The patient also noted multiple spontaneous bruises present for several weeks that progressively expanded over the course of one week. He denied any recent trauma except for the fall to the right knee. He also denied any family history of bleeding or clotting disorders but endorsed aspirin 81mg use in the setting of his prior stroke. He denied alcohol use and recreational drug use. He actively resided at a local homeless shelter with limited access to utilities along with limited access to transportation for routine medical care. He had a primary care physician at the local VA but had trouble with keeping his appointments. Additional history revealed that his diet consisted of fried fish sandwiches and burgers from a local fast-food chain with no reported intake of fruits or vegetables for almost a year due to lack of access to food. He had no concerns of personal safety, no neighborhood concerns, a high school educational level, and a small network of social support. On physical exam, the patient was found to have multiple, firm hematomas of the bilateral lower extremities and right hand, a right knee hemarthrosis, spontaneous gum bleeding and scattered petechiae on the back and feet. His dentition was poor, with yellowing of the teeth, multiple cavities, dried blood on his gums, and misalignment of the majority of his teeth. Perifollicular hemorrhages were present, but follicular hyperkeratosis and coiled hairs were absent. Initial differential diagnoses included nutritional deficiencies, vasculitis, and bleeding disorders. Vitamin C, K and E levels, as well as a factor panel measuring levels of Factors 2,7,8,9 and 10, a celiac panel, an iron panel, C3, C4, ANA, ESR, CRP, ANCA, BMP and CBC were ordered. The patient was found to

have microcytic anemia and iron deficiency anemia. His hemoglobin was 9.4g/dL, MCV of 69fl, and Iron level of 35mcg/mL, low folic acid and low Vitamin K. Vitamin C levels returned as < 0.01mg/dL, indicating deficiency (< 0.02mg/dL is diagnostic). In the setting of his iron deficiency anemia, it was decided to also do fecal occult blood testing to see if there was active GI bleeding, and the result was negative. All other testing was negative. He was supplemented with folic acid, Vitamin C, and Vitamin K due to low levels found in his lab results. His hematomas began to resolve over the course of three days, and he was discharged on oral vitamin supplementation with folic acid, Vitamin B12, and Vitamin C with an outpatient referral to physical therapy. He was to continue with the vitamin supplements for one month until his follow-up, physical therapy, and an appointment with our internal medicine department with repeat labs to ensure that his deficiencies were improving. We were able to arrange transportation for him, through help from our social workers, so that he could get back and forth to physical therapy as well as his follow up appointments.

DISCUSSION

There are many vitamins, minerals and nutrients necessary for the human body to function properly. Vitamin C is no exception. Vitamin C is responsible for aiding in the synthesis of collagen and is critically important for processes such as wound healing. Consequences of not maintaining the amount of vitamin C intake recommended include perifollicular hemorrhages, bruising, hemodynamic instability, hemolysis and increased risk for fever and infection[1]. The classic presenting symptoms of vitamin C deficiency include fatigue, malaise, ambulatory dysfunction, easy bruising and petechiae, and poor dentition. Our patient presented with many similar presenting symptoms: perifollicular hemorrhages, spontaneous gum bleeding, scattered petechiae on the back and feet, yellowing of the teeth, multiple cavities, dried blood on his gums, and misalignment of the majority of his teeth, as well as hemarthroses. Based on the patient's history and high risk profile (e.g. reported diet, and limited access to nutritious foods), vitamin C deficiency remained high on our differential, and was confirmed with laboratory testing revealing a Vitamin C level <0.01mg/dL. Management for vitamin C typically depends on the patient's age and sex[4]. In children presenting with vitamin C deficiency, it is recommended that they receive 100mg three times daily for one week, then once daily until all symptoms have resolved. Adults that present with Vitamin C deficiency are recommended 300-1000mg daily for a month. The daily recommended vitamin C intake for children is 14-45 mg/day, and for adult females 75 mg/day is recommended[3-5]. Our patient, an adult male, would be recommended to take in about 90 mg/day of vitamin C to receive the recommended dosage. If left untreated, scurvy can have devastating effects such as hemorrhage, severe infections, wound healing impairment, multi-organ dysfunction, and possibly death. It is important to recognize these signs and symptoms in our patients, and as physicians it is important to recognize rare cases such as scurvy so that we may not misdiagnose our patients.

The social history of our patient, with his current living situation as well as access to food, water, shelter, etc. played an important role in the progress of his condition. There are many risk factors for developing this disease and along with the poverty and homelessness our patient experienced, his smoking history had also put him at risk for developing scurvy. In the general population, beyond the risks of poverty and smoking, there can be many factors contributing to the development of scurvy including: alcoholism, psychiatric illness, "tea and toast" diet, popular diets, irritable bowel syndrome, Chron's disease, celiac disease, type 1 diabetes, non-breast fed infants and restrictive diets seen in autistic children[9,10]. The circumstances surrounding our patient opens the door to looking at social determinants of health as a major factor in the development of this condition, especially in the modern United States. Social determinants of health that should be screened for include: food access, housing, transportation, personal safety, utilities, social support, education and neighborhood environment. The benefits of screening for these social determinants of health is that we can identify patients at high risk and provide them with the resources they need to improve these aspects of their lives, and indirectly improving their health by doing so. The patient's lack of access to fresh fruits and vegetables, as well as his lack of education about which foods are needed to maintain adequate nutrient and mineral stores played an important role in his vitamin deficiency. Educating our patients and paying close attention to their eating habits is an important part of our roles as physicians, one that can be easily overlooked in the context of busy clinical lives. This also opens the door for discussion about social determinants of health in general, about the importance of providing people with basic needs in terms of food, so that we may prevent them ending up in the hospital in the first place with deficiencies. Education is another important aspect of the social

https://scholarcommons.towerhealth.org/t-med/vol1/iss3/6
DOI: https://doi.org/10.54299/tmed/dhoy5611

determinants of health that played a role in the development of this patient's condition. It raises the question as to where this information should be reinforced. It should certainly be reinforced with visits to their primary care physician, but if a patient does not regularly visit their physician because of personal or financial issues, how are they supposed to reinforce this information? Should it be the job of our education system, or political action as well? There are many areas through which we can seek improvement, so that our patients may avoid deficiencies in necessary nutrients such as these.

This case serves as a good review of the signs and symptoms as well as the pathophysiology behind scurvy, in the setting of a case with both classic and non-classic symptoms of the vitamin deficiency. It also serves as a foot in the door for the discussion about social determinants of health and their impact on the development of certain disease states as well.

CONCLUSIONS

Since vitamin deficiencies like scurvy are so rare in developed countries, it is important to keep a broad differential. Likewise, it is essential to obtain a detailed history including diet, family, and social aspects when clinical suspicion for scurvy is high. Keeping in mind the social determinants of health for our patients can be monumental in maintaining their health and nutrition. An more impactful approach would be acting upon situations where social determinants of health are having a direct effect on patients. It has been shown that screening for social determinants of health can be an effective measure, and can be regularly incorporated into the workflow of taking care of a patient[11]. Acting upon these aspects of a patient's life can have a significant positive impact on their health, helping to greatly improve quality of life. Although scurvy is easily treatable and has an excellent prognosis, if missed, there are deadly consequences.

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