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CASE REPORT

Oral Vitamin C (Ascorbic Acid) Allergy and Avoidance Leading to Severe Hypovitaminosis C

Marissa Love, M.D.[1], Muhammad Imran, M.D.[2], Ayesha Irum, M.S. [3], Garth Fraga, M.D.[4], Selina Gierer, D.O.[2]
University of Kansas Medical Center, Kansas City, KS
[1]Department of Pediatrics
[2]Department of Internal Medicine, Division of Allergy, Clinical Immunology & Rheumatology
[3]Army Medical College, Rawalpindi, Pakistan
University of Kansas Medical Center, Kansas City, KS
[4]Department of Pathology & Laboratory Medicine

INTRODUCTION

Scurvy, or vitamin C deficiency, is rare in industrialized countries.[1] Vitamin C is an essential nutrient that is derived from the diet and patients with poor nutritional intake are primarily those affected. In industrialized nations, scurvy is observed mostly with severely malnourished patients, such as those living in poverty, drug or alcohol abusers, and neglected children or the elderly.[2]

Patients can present with vague constitutional symptoms including fatigue, irritability, myalgia and vasomotor instability.[3] The classic manifestations, which occur later, include perifollicular petechiae, bleeding gums, purpura, hemarthroses, coiled or corkscrew hairs, hyperkeratosis, and poor skin healing. Treatment is oral vitamin C replacement. Because vitamin C is nearly ubiquitous in the modern diet, it is rare to find a person with a vitamin C allergy.[2] There are no reports of allergy to oral vitamin C and only a few reported hypersensitivities to the vitamin C derivatives used in cosmetics.[4] We report the first case, to our knowledge, of severe hypovitaminosis C due to vitamin C allergy and avoidance.

CASE REPORT

A 51-year-old male presented with acute onset of bilateral lower extremity rash and dermal pruritus after ingesting a multivitamin tablet the night prior. He had a history of chronic generalized nonpruritic rash aside from the present dermal eruption. He also had a history of poor dentition, limited diet consisting mostly of fast food, and vitamin C deficiency for which he tried oral replacement therapy on three occasions. He reported not visiting a physician for 10 years. He denied a history of recent trauma, travel, tick bites, or medication changes.

Pertinent medical history included a 30 pack-year history of tobacco exposure. On physical examination, he had normal vitals, poor dentition, and three skin findings: 1) a chronic large ecchymoses over his lower abdomen, groin, and right thigh, 2) pitting edema in the lower extremities, and 3) acute palpable petechiae on his anterior shins with excoriations. Cutaneous punch biopsy demonstrated noninflammatory purpura with many extravasated erythrocytes. The biopsy was negative for neutrophilia, leukocyte karyorrhexis, endothelial cell alteration, or perivascular fibrin deposits (Figure 1). Infectious, autoimmune, and tick born etiologies were ruled out.

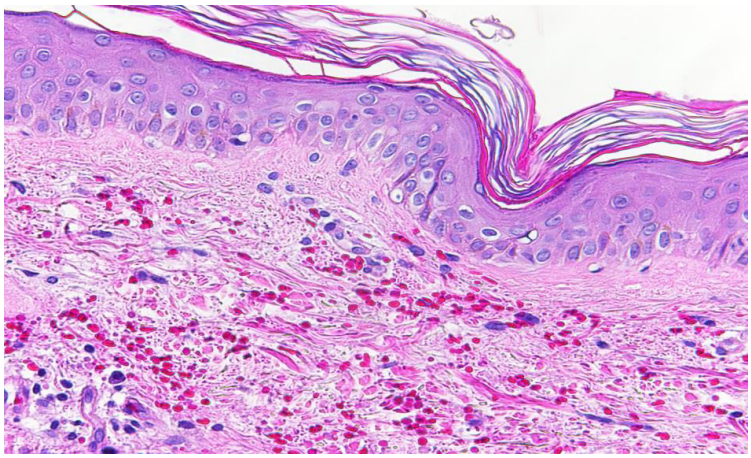

Figure 1. Cutaneous punch biopsy with non-inflammatory purpura and many extravasated erythrocytes. Notably, there is absence of neutrophilia, leukocyte karyorrhexis, endothelial cell alteration, or perivascular fibrin deposits.

The patient was severely vitamin C deficient with a vitamin C level less than 0.1 mg/dl (reference range 0.6 - 2.0 mg/dl), consistent with his history of avoiding ascorbic acid due to previous presumed allergic reactions. The vitamin C deficiency was believed to have caused his current mucocutaneous symptoms. He previously had taken ascorbic acid on three different occasions during his early adulthood. During all three episodes, he developed generalized hives within one hour of taking the medication. He denied associated angioedema, anaphylaxis symptoms, difficulty breathing, wheezing, cough, rhinorrhea, nasal congestion, sneezing, post-nasal drip, or gastrointestinal symptoms with these episodes. He recalled developing hives after eating oranges or drinking orange soda; skin testing as a child was positive to orange. Since then, he has avoided ascorbic acid supplements and foods high in ascorbic acid. He had not seen an allergist for follow-up during his adult life.

During his inpatient hospitalization, an allergist was consulted to address the possibility of ascorbic acid allergy and vitamin C desensitization. It was difficult to orchestrate inpatient vitamin C skin testing and there are no validated skin testing protocols for this nutritional supplement described in the medical literature. A protocol for desensitization using liquid ascorbic acid was created as no protocols existed in the literature.

The desensitization started with 1/10,000th of the final dose (100 mg) and slowly titrated up by 100% increments at each step to the full dose of 100 mg three times a day (Table 1). After each step, the patient was observed for 15 - 30 minutes. If he did not exhibit symptoms of allergic reaction, he was advanced to the next step. The patient then received full doses every eight hours thereafter. The patient tolerated the entire regimen without adverse events and was discharged with the oral supplement.

Table 1. Drug desensitization protocol of ascorbic acid with goal dose of 100 mg PO TID.

Dose #	Concentration	Dose
1	1:10,000	0.01 mg
2	1:5,000	0.02 mg
3	1:2,500	0.04 mg
4	1:1,250	0.08 mg
5	1:625	0.16 mg
6	1:300	0.33 mg
7	1:150	0.67 mg
8	1:75	1.3 mg
9	1:40	2.5 mg
10	1:20	5 mg
11	1:10	10 mg
12	1:5	20 mg
13	1:2.5	40 mg
14	Full strength dose	100 mg
	Total tolerated dose	180.11 mg

DISCUSSION

Vitamin C is an essential nutrient obtained from our diet.[1] Vitamin C and its derivatives are used safely in food, cosmetic, and pharmacology industries.[2] Although scurvy is rare in industrialized nations, it is seen in cases of poor nutrition and can lead to severe and fatal conditions.

A few reports of allergic reactions to vitamin C derivatives were found in topical cosmetics, resulting in contact dermatitis.[1-3] One abstract reported an allergic reaction after IV administration.[4] Another case reported a delayed type hypersensitivity reaction to oral ingestion of vitamin C, but there have not been any reports regarding desensitization to oral vitamin C.[5] This is the first case that described a desensitization protocol for oral vitamin C and one of the few cases of oral hypersensitivity with strict avoidance leading to scurvy.

In hindsight, this patient would have benefited from a prior proper allergic evaluation and education. His scurvy may have been avoided if he had received appropriate desensitization during young adulthood. Since vitamin C is ubiquitous in several foods, it raises the question if the patient was truly allergic to vitamin C. He actually may have been allergic to an excipient in oral vitamin C products.

In spite of repeated attempts to get the patient to keep a follow-up appointment and to contact the patient electronically and by mail, he was lost to follow-up. We are unaware if his clinical symptoms from scurvy improved or if he was able to eat any other foods containing vitamin C. He certainly tolerated oral vitamin C for more than seven days while hospitalized.

CONCLUSIONS

Patients with allergies to foods, particularly those that affect intake of essential nutrients such as vitamin C, need proper allergic evaluation, follow-up, and education to receive therapy to prevent serious consequences of nutritional deficiencies. In this case, an apparently successful desensitization was performed and long-term vitamin C replacement hopefully would alleviate the clinical symptoms of scurvy due to vitamin C hypersensitivity and avoidance.

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