CASE REPORT

Severe vitamin C deficiency in a child newly diagnosed with T-cell ALL due to nutrient gap

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SUMMARY

A 10-year-old boy developed a perifollicular rash during interim maintenance of T-Cell acute lymphoblastic leukaemia. Differential diagnoses included drug reaction and inflammatory process. Before diagnosis, the patient had a limited diet—low in vegetables and fruits—due to selective eating, with later anorexia and taste aversions due to chemotherapy treatment. Despite nutritional counselling and starting a multivitamin, the patient incurred severe weight loss (18.5% of his usual body weight). Serum levels of ascorbic acid were non-detectable, at $<5 \mu\text{mol/L}$, indicative of vitamin C deficiency. The patient began vitamin C supplementation containing 125 mg ascorbic acid three times a day for 7 days, then 125 mg once daily for 3 months to normalise serum vitamin C. After ascorbic acid treatment was completed, the patient started a complete multivitamin and made efforts to eat fruits and vegetables rich in vitamin C. His serum ascorbic acid concentrations normalised to $52 \mu\text{mol/L}$ 3 months after receiving supplementation.

BACKGROUND

Inadequate energy intake is an undesirable yet frequently observed complication in children with leukaemia receiving chemotherapy treatment. Chronic malnutrition in this population may result in depletion of serum concentrations of several nutrients, affecting immune status, growth and wound healing.

Vitamin C (ascorbic acid) is a necessary nutrient for immune function, cell regeneration and growth. Dietary sources of vitamin C include fruits and vegetables, with orange juice, guava, red and yellow peppers, and papaya serving as rich sources.

Clinical manifestations of vitamin C deficiency or scurvy include gingival inflammation and bleeding, perifollicular petechiae and bone pain.¹

The objective of this article is to describe the association between chronically low vitamin C dietary intake and dermatological manifestations of vitamin C deficiency in a paediatric patient with leukaemia.

CASE PRESENTATION

We report a case of a 10-year-old boy with T-Cell acute lymphoblastic leukaemia (ALL) in the interim maintenance phase of therapy. He originally presented the ALL with small raised lesions on his scalp, which were biopsied and found to be T-cell ALL. Bone marrow confirmed the diagnosis. He was started on chemotherapy and tolerated induction relatively well. When he was in the interim

maintenance phase of therapy, he presented to hospital with bilateral perifollicular petechiae to the arms, knees and legs, which progressed into hyperpigmentation suspected to be related to a drug reaction or inflammatory process (figure 1). He was otherwise well, with no other significant symptoms.

Since diagnosis, the patient had consistently poor energy intake, specifically limited in vegetable and fruit consumption, and, as a result, incurred a severe weight loss of 18.5% of his usual body weight. Despite dietary education and recommendations to increase overall energy intake, and specifically dietary consumption of vegetables and fruits, the patient was unable to improve his energy intake.

INVESTIGATIONS

Dermatology service personnel were consulted and, post clinical assessment, requested a serum level of vitamin C for the patient, as they felt the rash was pathognomonic for vitamin C deficiency. The resultant blood work showed low vitamin C levels with serum concentrations of $<5 \mu\text{mol/L}$, indicative of vitamin C deficiency. All other investigations were normal.

DIFFERENTIAL DIAGNOSIS

- Drug reaction
- Inflammatory process
- Folliculitis.

TREATMENT

The patient was placed on treatment doses of oral supplemental ascorbic acid: 125 mg three times a day for 7 days, then once daily for a period of 3 months to normalise serum levels of vitamin C.

Figure 1 Leg showing perifollicular petechial rash.

CrossMark

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OUTCOME AND FOLLOW-UP

Serum vitamin C levels were checked in follow-up and both values resulted as sufficient:

Three months postsupplement administration: 52 µmol/L

Six months postsupplement administration: 84 µmol/L

A serum level ≥ 25 µmol/L is considered a sufficient serum level of vitamin C.

The vitamin C deficiency treatment was completed and the symptoms resolved. The patient then made a concerted effort to include food sources rich in vitamin C into his diet.

DISCUSSION

Vitamin C deficiency is rare. Although uncommon, some case studies have documented reports of children with scurvy who

have poor socioeconomic status, restrictive religious practices, developmental delays such as autism or cerebral palsy, or in whom overall nutritional intake of vegetables and fruits is limited.^{1–3}

Altered nutritional status is common in children at diagnosis and during treatment for cancer. Protein energy malnutrition is frequently seen with significant weight loss, as can occur at diagnosis of cancer, and is associated with deficiencies in essential nutrients and vitamins. A recent review of paediatric patients at diagnosis of cancer found that the vitamin C level was significantly decreased compared with controls, and this decrease continued at 6 months following diagnosis.⁴

Overall, patients at diagnosis are at risk of nutrient deficiencies, including of vitamin C, and this must be considered in their care.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Learning points

- ▶ Dietary screening/monitoring plays a crucial role in detecting gaps in nutrient intake. Nutrition education can impart an important role in preventing nutrient deficiencies, deficits that can compromise the health status of the patient.
- ▶ Patients diagnosed or being treated for cancer can have significant nutrient deficiencies and these should be screened for if there is a gap in nutrient intake, as they are at risk for deficiency of essential vitamins.
- ▶ Although rare, vitamin C deficiency exists in paediatric populations within Canada.

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