

CPD

Zinc deficiency and severe protein–energy malnutrition in a child with atopic eczema

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An 18-month-old boy was admitted by paediatricians owing to generalized oedema, marked lethargy and a suspected flare of atopic eczema (AE). He was under regular dermatology review for his AE, which was usually controlled with emollients and moderate-strength topical steroids. His weight had been following the centile charts appropriately. He had been diagnosed with non-IgE-mediated cow's milk protein allergy by paediatricians at the age of 10 months and switched to a formula milk, after which he was lost to follow-up. When the child reached 12 months of age, the formula prescription was stopped by the patient's general practitioner, and advice was given to change him to rice milk (containing 0.3 g protein/100 g, compared with 3.4 g protein/100 g in cow's milk). The patient was reported to be a poor eater with an aversion to food with a solid texture, and his diet consisted largely of chocolate rice cereal, potato chips and approximately 1 L of rice milk per day. The family had a complex social background, and the patient lived with his mother and two sisters in a women's refuge hostel with a shared kitchen.

On examination, the patient was found to have whole body oedema. He was notably lethargic and background AE was present diffusely over his abdomen (Fig. 1a). There was an erythematous, serpiginous rash with an active inflammatory edge in the groin, genital skin and buttocks (Fig. 1b). The hair and nails were normal. Routine observations were normal for the child's age.

Blood count was normal except for mild normocytic anaemia (haemoglobin 98 g/L; normal range 120–140 g/L). Bone profile, renal and thyroid function, and ferritin, vitamin B12, folate and immunoglobulin levels were normal. Albumin and total protein were severely reduced at 11 g/L (normal range 35–60 g/L), and 26 g/L (60–80 g/L), respectively. Alanine



Figure 1 (a) Eczematous rash over the abdomen with clinical evidence of ascites; (b) serpiginous rash over groin, extending to the buttocks and genitals.

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transaminase was elevated at 52 U/L (1–40 U/L). Urine protein creatinine ratio was normal, and ultrasonography showed marked ascites and small bilateral pleural effusions.

Zinc deficiency with concurrent protein–energy malnutrition was suspected, and analysis of zinc level was requested; this was later reported as 4.2 $\mu\text{mol/L}$ (normal range 5–15 $\mu\text{mol/L}$). The patient was treated empirically with oral zinc sulfate 1 mg/kg, thiamine 100 mg daily, oral phosphate replacement and multivitamins. His diet was reviewed and optimized by a dietician, who estimated that the patient had a daily intake of 2–3 g of protein per day, compared with the 14.5 g required in a child of his age. Two weeks later the patient's skin had cleared completely, his oedema had resolved and his albumin level had improved to 40 g/L.

Protein–energy malnutrition, typically considered a problem of low-income countries, may re-emerge in high-income countries in the context of allergy and dietary restriction, especially where social circumstances mean inadequate dietary supervision. This case highlights the importance of being aware of the nutritional status of children with AE and restricted diets.

The majority (80%) of zinc in plasma is bound to albumin, and zinc deficiency is frequently seen in association with protein–energy malnutrition from inadequate zinc in the diet, often seen in those with alcohol excess or intestinal malabsorption.¹ Zinc is required for normal keratinization and immune function, and serves as a cofactor for many enzymes of the gastrointestinal tract and bone metabolism.²

Acrodermatitis enteropathica is the classic cutaneous manifestation of zinc deficiency, favouring a perioral distribution. Asteatotic eczema may also be a presenting feature, and zinc-deficiency dermatitis reported in breast-fed infants is often misdiagnosed as AE or impetigo.² Our patient had the clinical features of necrolytic migratory erythema (NME), classically described as an irregular, erythematous, serpiginous rash with an advancing border. It is now well recognized that an NME-like rash can also be a presenting feature of patients with underlying zinc deficiency.³ The pathogenesis of NME is unclear, and appears to be multifactorial. The nutritional hypothesis suggests that amino acids, zinc and essential fatty acid depletion may be implicated.⁴ 'Peeling-paint' dermatitis, an erosive, desquamating dermatitis with classic 'pasted-on' scale, is the most common dermatosis in protein–energy malnutrition, but it can also be a presenting feature of cystic fibrosis.⁵

To our knowledge there are no reports of an NME-like rash secondary to zinc deficiency in a child. In children with AE, multiple allergies or restricted diets, it is vital that clinicians are alert to possible and impending nutritional deficiencies. Early dietician involvement is essential to prevent the consequences of refeeding syndrome.⁶

References

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CPD questions

Learning objective

To recognize the presentation of zinc-deficiency dermatoses and protein–energy malnutrition in a child.

Question 1

Which of these is the earliest sign of protein–energy malnutrition?

- (a) Abdominal swelling.
- (b) General fatigue and lethargy.
- (c) Loss of muscle mass.
- (d) Increased risk of infections.
- (e) Nail changes.

Question 2

What is the most recognized clinical presentation of a zinc-deficiency dermatosis in children?

- (a) An eczematous rash favouring a flexural distribution.

- (b) A rapidly evolving petechial eruption.
- (c) An inflammatory rash around the mouth and anus.
- (d) A vesicular rash favouring the mouth, palms and soles.
- (e) Erythema of the cheeks.

Instructions for answering questions

This learning activity is freely available online at <http://www.wileyhealthlearning.com/ced>.

Users are encouraged to

- Read the article in print or online, paying particular attention to the learning points and any author conflict of interest disclosures
- Reflect on the article
- Register or login online at <http://www.wileyhealthlearning.com/ced> and answer the CPD questions
- Complete the required evaluation component of the activity

Once the test is passed, you will receive a certificate and the learning activity can be added to your RCP CPD diary as a self-certified entry.

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