A case of a rapid skin eruption caused by zinc deficiency

A case of zinc deficiency in an ex-premature infant is described. The infant presented with a cutaneous eruption that started on her chest and rapidly spread to involve her face and neck. Oral zinc was commenced and the child's skin rapidly improved. Acrodermatitis enteropathica is usually an inherited form of zinc deficiency although rarely it can have a transient acquired cause, as in this case.

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Key points

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1. Acrodermatitis enteropathica is a rare form of zinc deficiency characterised by skin lesions, alopecia and diarrhoea.
2. Zinc deficiency can be inherited or acquired – the acquired form of the disease may be associated with prematurity.
3. Commencement of oral zinc can confirm the clinical diagnosis, as revealed by a rapid improvement in the patient's skin.
4. The number of transient acquired zinc deficiency cases may be expected to increase as more premature infants survive.

The case study

Baby T was born at 28 weeks' gestation to non-consanguineous parents of Indian ethnicity. She had an uncomplicated neonatal period and was well at discharge on day 73 of life. At four months of age, she presented with a cutaneous eruption that started on her chest and rapidly spread to involve her face and neck. She was treated for a presumed skin infection with fusidic acid cream and mupirocin ointment, both antibacterial preparations, but there was no improvement.

On further review, she was noted to have superficial desquamation on an erythematous background, more pronounced on the neck and upper chest (**FIGURE 1**). She was treated with intravenous antibiotics for suspected staphylococcal scalded skin syndrome. She subsequently developed tense blisters affecting her fingers and toes (**FIGURE 2**).

The differential diagnoses included acrodermatitis enteropathica, acrodermatitis metabolica and junctional epidermolysis bullosa. The following investigations revealed no abnormalities:

- skin swabs
- full blood count
- alkaline phosphatase levels
- serum zinc levels

Given the involvement of acral sites (limb or other extremity), the clinical features were most in keeping with a diagnosis of acrodermatitis enteropathica,[1] despite the normal zinc level. The infant was commenced on oral zinc empirically and within 72 hours her skin rapidly improved.

Analysis of the *SLC39A4* gene on chromosome 8 was normal excluding a hereditary cause. The diagnosis is thought to be an acquired form of zinc deficiency that may be due to prematurity, having total parenteral nutrition (TPN) at the start of life and being solely breastfed.[2] Baby T remained on oral zinc for 10 months and her skin has completely recovered (**FIGURE 3**).

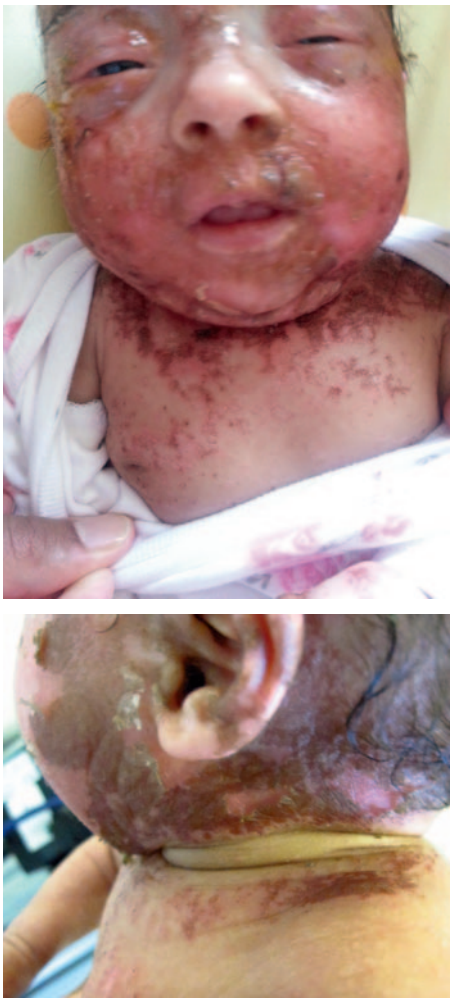

FIGURE 1 Superficial desquamation on an erythematous background.

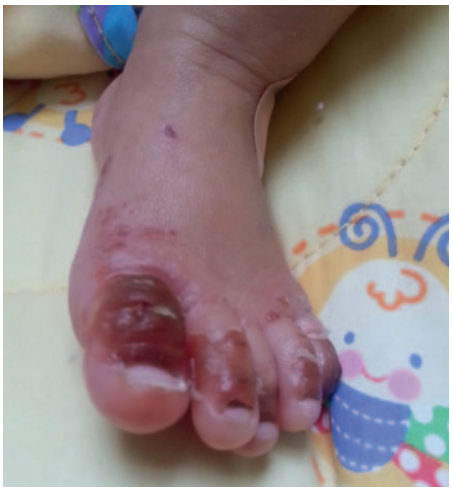

FIGURE 2 Tense blisters on the toes.

Discussion

Zinc is an essential trace element found in cells throughout the body. It plays a role in cell division, cell growth, wound healing and normal immune function. Acrodermatitis enteropathica, a disorder caused by zinc deficiency, is classified as either an autosomal recessive genetic disorder (meaning that an infant needs to inherit a defective gene from both parents) or as an acquired transient condition.[2] The birth prevalence is published as 1/500,000.[3]

The inherited form is most commonly caused by a gene mutation on chromosome 8 – the *SLC39A4* gene, which codes for the zinc transporter protein, ZIP4. The encoded protein localises to cell membranes and is required for zinc uptake in the intestine. The mutant gene codes for a defective protein and consequently zinc is not absorbed through the intestine effectively.

The transient acquired form of the disease is not caused by malabsorption of the trace element: it is usually due to low nutritional support. Less commonly, it can also be caused by decreased release of zinc from the blood to peripheral cells. This decreased peripheral release could explain why the blood zinc level overall can remain normal.[2]

In the hereditary form of the disease, bottle-fed infants usually present with symptoms in the first few weeks of life. Breastfed infants present later, typically around the time of weaning. This is due to superior absorption of zinc from human milk than from formula or cows' milk.

The skin manifestations described in this case are diagnostic of the disease. The skin around the perianal area is often affected. Other symptoms often seen include alopecia, irritability, failure to thrive, neurological and behavioural changes and profuse diarrhoea, however, not all of these symptoms may be seen in the transient acquired form of the disease.

Transient acquired acrodermatitis enteropathica is seen more commonly in premature infants with low birth weights than in term babies.[4,5] It is known that premature infants require higher amounts of zinc to maintain normal levels and there are several causes that could lead to zinc deficiency:[6]

1. A fetus normally accumulates zinc *in utero* during the third trimester, which is cut short when an infant is born prematurely.
2. Premature infants usually receive TPN, which may not always contain enough zinc.
3. The nursing mother may be zinc deficient or unable to pass zinc from serum to breast milk effectively, producing a transient zinc deficiency in an exclusively breastfed infant.
4. As premature infants do not suckle until they are mature enough, they may not receive milk containing the maximal level of zinc as levels can fall over the period of lactation maintenance.

It is thought that the skin manifestations appear at a time of rapid growth in the transient acquired form of the disease. This may explain the delayed presentation to four or five months of age.[4]

Often there is a delay in diagnosis in both forms of the disease as the skin manifestations are similar to those seen in the common bacterial infection impetigo. Other diagnoses are only sought once there is a lack of improvement after antibiotic treatment.

Independent of the cause for the disease, the treatment is to give oral zinc and the symptoms usually improve within four to 28 days.[4] Children with the inherited form of the disease will need life-long treatment, but children with the transient acquired condition will just need treatment until the symptoms have resolved and zinc stores are replenished. Without treatment, this condition is fatal within the first few years of life.

Conclusion

Transient acquired zinc deficiency is a rare but important disorder. Diagnosis can be delayed and often requires input from a dermatologist. This report illustrates the importance of zinc in rapidly growing preterm infants. The number of cases seen in practice may be expected to increase as more premature infants survive.

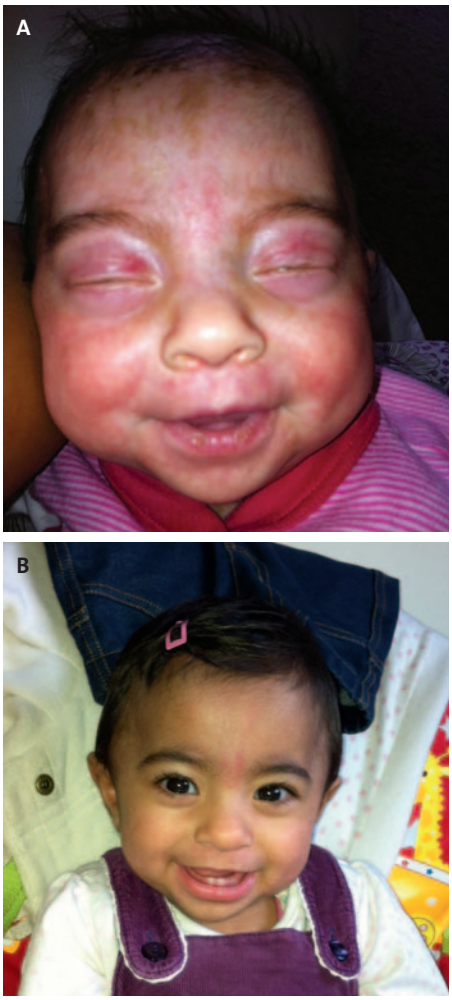

FIGURE 3 Following zinc treatment. A) six days of treatment. B) Six months of treatment.

Patient consent

The authors received written consent to publish this report from the patient's mother.

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