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Short Stature in Children with Atopic Eczema

T. J. DAVID

Department of Child Health, University of Manchester, England

Short stature, defined as a standing height below the third centile when corrected for mid-parental height, was found in 22% of children with atopic eczema troublesome enough to cause regular attendance at hospital. The cause of this short stature is unknown in most cases, but contributory factors comprise topical steroid therapy, co-existing asthma, inhaled or oral steroid therapy, malnutrition due to unsupervised dietary restriction, loss of sleep, and vitamin D deficiency. If the short stature is simply associated with severe disease and not attributable to steroid therapy, and if the disease remits before puberty, then catch-up growth can be expected. If the short stature is caused by steroid therapy, or if severe disease persists into adult life, then permanent growth stunting may occur.

Dr T. J. David, Booth Hall Children's Hospital, Charlestown Road, Blackley, Manchester M9 2AA, England.

Children with atopic eczema who are referred to hospital usually attend dermatology clinics, and it may be for this reason that the short stature associated with atopic eczema has been seriously neglected. The subject is not mentioned in any of the three major books about atopic eczema (1, 2, 3), all written by dermatologists, and has only recently been the subject of systematic study (4). A number of children with severe eczema now attend paediatric clinics, partly because of the generally handicapping nature of the disorder, and also for the supervision of elimination diets. The result is an increasing interest in the effects that the disease and its treatment have on nutrition (5) and growth.

In the only published study of growth in atopic eczema, 89 children from the Manchester area were examined and nine (10%) had a standing height below the 3rd centile (4). When the height centile was corrected for the mid-parental height, then 22% of the patients were found to be below the 3rd centile. The reduction in height was relatively greater when looking at the sitting height compared with the sitting leg length. The distributions for weight and skinfold thickness were not significantly different when the patients were compared with the normal population. Skeletal maturity was delayed in children with eczema, and this delay was greater in girls than boys. The conclusion was that about one in five children with generalised atopic eczema, severe enough to warrant regular hospital visits, had impaired growth.

The cause of growth impairment in atopic eczema is unknown. There are several possible explanations. It is likely that one or more of these combine in an individual patient to cause short stature. The contributory factors are:

1. *Severe atopic disease*

The Manchester study found that short stature correlated most strongly with the surface area of skin affected by atopic eczema (4). The larger the area affected, the greater was the degree of growth impairment. This finding gives no clue as to whether it is the disease or its treatment which causes short stature.

2. *Topical corticosteroids*

Percutaneous absorption of even the weakest topically applied steroids has been repeatedly demonstrated (6, 7, 8, 9, 10, 11, 12). Adrenocortical suppression (12, 13), dwarfism (14) and iatrogenic Cushing's syndrome (6, 8, 11, 13) are also described following the use of topical steroids. In a recent study of 13 children with atopic or seborrhoeic dermatitis which was being treated with 1% hydrocortisone cream, no less than five were found to have suppressed adrenocortical function as assessed by a 2 hour ACTH test (13). Percutaneous absorption of steroids is enhanced by occlusion (7) and probably by the presence of an inflammatory skin disease such as atopic eczema (15). The site of application influences the rate of absorption, and in one study the absorption of hydrocortisone through the skin of the scrotum was 42 times and the skin of the forehead six times that of the ventral skin of the forearm (16). Nevertheless, despite the use of topical steroids over many years, there are no scientifically based guidelines for a safe weekly dosage of topical steroids in children. Such guidelines as there are for adults (who are no longer at risk of growth impairment) are entirely empirical (17).

The Manchester study showed a progressive relationship between the potency of topical steroids and

short stature (4). This may reflect a direct effect of topical steroids, or it may simply be an indirect effect of disease severity. Six of the 15 shortest patients had been regularly receiving British National Formulary (18) category I or category II (potent or very potent) topical steroids for at least two years. The eczematous lesions in these six patients were not particularly severe or widespread. It is clearly possible that the prolonged use of potent steroids, particularly where there was a large area of skin affected, may well have been a contributory cause of short stature in these six patients. It is desirable to avoid unnecessary prolonged use, over a large skin surface area, of potent topical steroids.

3. *Asthma*

Several investigations (19, 20, 21) have demonstrated an association between asthma and impaired growth, although the cause of this growth impairment is unclear. Asthma may contribute to the short stature seen in children with atopic eczema, and indeed the Manchester study found a relationship between the severity of co-existing asthma and growth impairment (4). Although asthma may be a cause of short stature in atopic eczema, it is also possible that asthma is simply a feature that is correlated with the presence of more extensive atopic eczema. It is theoretically possible that the excessive use of inhaled steroids for the treatment of asthma may contribute to growth impairment, but there was no evidence of this in the Manchester study.

4. *Malabsorption*

Several abnormalities of the gastrointestinal tract have been reported in children with atopic eczema. Defective gastrointestinal handling of certain proteins may play a part in the pathogenesis of atopic eczema, and altered gastrointestinal permeability has been reported by some (22, 23) but not others (24). Furthermore, partial villous atrophy was found among an atypical group of children with eczema (25). Thus malabsorption could in theory contribute to the growth failure seen in atopic eczema, but at present there is no clinical evidence to support this contention. The patients with short stature in the Manchester study did not have loose stools or iron deficiency, and they were not underweight.

5. *Increased nutritional requirements*

Children with severe atopic eczema spend a lot of time scratching, and it is possible that this activity, which can be frenzied at times, and which may continue for much of the night, may increase the child's energy requirements. Heat and protein loss through the skin may also increase nutritional requirements. These aspects have never been investigated, but remain possible contributory causes to short stature.

6. *Unsupervised dietary restriction*

One therapeutic approach to atopic eczema in childhood is to employ an elimination diet (26). Sadly it is not uncommon to see children who have been placed on such a diet without any supervision by a dietitian. Such children are at risk of receiving a nutritionally inadequate diet, and a study in Manchester documented significantly low calcium intakes in children on milk free diets (5). We have also seen patients on very bizarre diets which were deficient not just in calcium but also in protein and carbohydrate, and such children are clearly at risk of growth impairment as well as other nutritional deficiencies (27). Although this aspect has not yet been systematically studied, it is unlikely to be a common cause for the growth impairment seen in children with eczema.

7. *Rickets*

We have seen two children with severe generalised atopic eczema who presented with complete growth failure. Both children were found to have rickets. Their growth improved when they received supplemental calcium and vitamin D by mouth. The cause of the rickets was unclear. The first patient was Caucasian and was receiving a casein hydrolysate milk formula as part of a milk free diet. Unknown to us, she stopped drinking the milk substitute because she disliked the taste, and so her calcium intake became very low. Whether the low calcium intake on its own could have accounted for her rickets was uncertain, and we suspected that a major factor was that she had been excluded from sunlight for about three years.

The second patient was of Asian origin and he too was receiving a casein hydrolysate milk substitute and was very rarely exposed to the sunlight. In his case we again suspected that vitamin D deficiency was the major cause of the rickets, though he may also have been genetically predisposed to rickets because of his Asian origin.

The two lessons here are firstly to bear in mind that the calcium content of milk substitutes is usually considerably less than that of ordinary cows milk (5), and that one has to be on the look out for a child who stops drinking his or her milk substitute. The other

point is that some children with severe eczema are kept out of the sunlight by their parents, and such children are bound to require oral vitamin D supplementation.

8. *Loss of sleep*

Severe atopic eczema invariably interrupts and prevents sleep, and this might interfere with growth hormone release. However in an unpublished study of children with atopic eczema and severe short stature, we found normal growth hormone release during sleep and it is unlikely that failure to release growth hormone is the mechanism of short stature. It is unknown whether prolonged sleep deprivation in atopic eczema could reduce the overall time available for physiological growth hormone release.

9. *Systemic steroids*

A few children with severe generalised atopic eczema unresponsive to conventional therapy may require prolonged treatment with systemic steroids, and clearly such patients are at risk of short stature. If oral steroids are required then it is worthwhile trying to administer them on alternate days, as this may cause less growth impairment (28, 29, 30). If daily steroids are required then to achieve a minimum growth inhibiting effect the steroids should be given as a single dose first thing in the morning (30, 31).

If treatment with steroids is prolonged then catch-up growth may not occur when steroids are stopped (32). It used to be thought that ACTH caused less growth stunting effect than oral steroids (33), but this is now known to be untrue (34).

PROGNOSIS

Without longitudinal studies, the future for children with growth impairment associated with atopic eczema is uncertain. Logic dictates that if the short stature is related to severe disease rather than steroid therapy, and if the disease remits before puberty, then catch-up growth can be expected. This has been our undocumented observation, and it is consistent with observations made in children with asthma (9). If the short stature is caused by steroid therapy, or if severe disease persists into adult life, then permanent growth stunting may occur.

CONCLUSIONS

Short stature, defined as a standing height below the third centile when corrected for mid-parental height, is found in approximately 20% of children with atopic eczema troublesome enough to cause regular attendance at hospital. The cause of this short stature is unknown in most cases, but contributory factors comprise topical steroid therapy, co-existing asthma, inhaled or oral steroid therapy, malnutrition due to unsupervised dietary restriction, loss of sleep, and vitamin D deficiency. It is clearly desirable to avoid unnecessary prolonged use of potent topical steroids especially over a large skin surface area. It is essential that a dietitian supervises any exclusion diet. Children with eczema who avoid the sunlight are likely to need oral vitamin D supplementation.

Severe atopic eczema is often complicated by asthma. The treatment of this, and the assessment of growth and nutrition, remain the province of the paediatrician, and there is a case to be made for paediatricians to take an increasing interest in the management of severe atopic eczema in childhood.

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