Body segments and growth hormone

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SUMMARY The effects of human growth hormone treatment for five years on sitting height and subischial leg length of 35 prepubertal children with isolated growth hormone deficiency were investigated. Body segments reacted equally to treatment with human growth hormone; this is important when comparing the effect of growth hormone on the growth of children with skeletal dysplasias or after spinal irradiation.

There are only a few reports about sitting height and subischial leg length in children who are growth hormone deficient and being treated with human growth hormone, and none of these studies has been for more than two years.^{1,2} We describe the effects of human growth hormone treatment for five years on height, sitting height, and subischial leg length in 35 prepubertal children with isolated growth hormone deficiency.

Patients and methods

Thirty five children (25 boys, 10 girls) who were prepubertal throughout the treatment period were studied. Mean chronological age of the patients at the start of treatment was 7.5 years (range 2.2–12.7 years) and bone age 5.6 years (range 1.0–9.7 years).

Patients were measured at intervals of three months for at least one year before treatment and during the first two years of human growth hormone treatment and subsequently every six months. Subischial leg length represents standing height minus sitting height. To allow comparison between different ages and between sexes, all measurements were expressed as a standard deviation score (SDS) for both chronological age and bone age.^{1,3} Bone age was assessed annually using the TW2 method.⁴

Growth hormone deficiency was diagnosed by a growth velocity less than the 25th centile for age for two years or more and a growth hormone response of less than 15 mU/l to insulin induced hypoglycaemia. This test was combined with pituitary stimulation using intravenous thyrotrophin releasing hormone (200 µg) and gonadotrophin releasing hormone (100 µg). All patients fulfilled the Health Services Human Growth Hormone Committee re-

quirements for treatment with human growth hormone. Human growth hormone was administered three times a week using doses of 12 or 15 units per week.

Analysis of variance of repeated measurements was used to assess differences between the means of height, sitting height, and subischial leg length in each treatment year compared with the pretreatment year. The Newman-Keuls test was applied to assess the significance of the differences between means.

Results

Height SDS, sitting height SDS, and subischial leg length SDS for chronological age and bone age in all treatment years are shown in the figure. SDS for chronological age for all three parameters increased significantly throughout the treatment years, but

Figure Changes in height (□), sitting height (○), and subischial leg length (●) SDS for chronological age and bone age during growth hormone treatment. Data shown as mean (SEM).

SDS for bone age did not change. The difference between mean sitting height SDS and mean subischial leg length SDS remained unchanged over the five year study period.

Discussion

The availability of large quantities of biosynthetic growth hormone have stimulated many investigators to use this agent in short children who are or are not growth hormone deficient, such as those with dysmorphic syndromes, skeletal dysplasias, and normal short stature. The effect of growth hormone treatment on body segments therefore becomes an important consideration. We have compared the growth of upper and lower segments in children with isolated growth hormone deficiency. Although caution needs to be exercised in the interpretation of sitting height standards (SM Herber, RDG Milner. Have sitting height standards changed? Abstract G87; 58th Annual Meeting of the British Paediatric Association, York, 1986.), our results confirm that sitting height and subischial leg length react equally to human growth hormone treatment in prepubertal children over many years of treatment. Growth hormone treatment in these children prevented further loss in stature which would ensue if treatment had not been initiated. Growth hormone treatment, however, did not improve the height prognosis at the commencement of treatment, as judged by little change in height SDS for bone age. Instead it ensured that the child's remaining growth was 'normalised'.

These findings have important implications. We

would predict that the response of children who have skeletal dysplasia to growth hormone will not be as much as might be expected because of a lack of either the spinal or lower limb component or both to the growth response to growth hormone treatment. Similar findings have been observed in children who have received craniospinal irradiation and been treated with growth hormone.⁵ Changes in standing height in such individuals should not be used to define response but rather the change in body segments should be calculated.

References

- ¹ Tanner JM, Whitehouse RH, Hughes PCR, Vince FP. Effect of human growth hormone treatment for 1 to 7 years on growth of 100 children, with growth hormone deficiency, low birth weight, inherited smallness, Turner syndrome, and other complaints. *Arch Dis Child* 1971;45:745-79.
- ² Sogro W, Zachmann M, Tassinari D, Fernandez F, Prader A. Longitudinal anthropometric measurements in patients with growth hormone deficiency. Effect of human growth hormone treatment. *Eur J Pediatr* 1982;138:38-45.
- ³ Tanner JM, Whitehouse RH. *Atlas of children's growth normal variation and growth disorders*. London: Academic Press, 1982.
- ⁴ Tanner JM, Whitehouse RH, Cameron NC, Marshall WA, Healy MJR, Goldstein H. *Assessment of skeletal maturity and prediction of adult height (TW2)*. London: Academic Press, 1983.
- ⁵ Shalet SM, Whitehead E, Chapman AJ, Beardwell CG. The effects of growth hormone therapy in children with radiation-induced growth hormone deficiency. *Acta Paediatr Scand* 1981;70:81-6.

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Fatty liver and medium chain triglyceride (MCT) diet

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SUMMARY A 12 year old boy with intractable epilepsy developed fatty infiltration of the liver after three years' treatment on the medium chain triglyceride (MCT) diet. This was not associated with any hepatic dysfunction and resolved after discontinuing the diet. Three of four other patients on the same diet had evidence of hepatic steatosis.

Sills *et al*, working at Leeds General Infirmary, reported the beneficial effect of the medium chain triglyceride (MCT) diet on the treatment of epilepsy in childhood.¹ Adverse side effects have included mild abdominal pain and diarrhoea, and one patient suffered transient blindness when vitamin supplementation was omitted. More recently we have been aware of the problem of fatty infiltration of the liver.

Case report

The patient, a boy, had been noted at birth to have

Ketogenic diets for the treatment of intractable epilepsy have been used for over 60 years. In 1986