ABC of 1 to 7

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GROWTH FAILURE

Parents may be worried because they consider their child to be too short, or too thin, or both. The infant's height is usually not noticed until he starts walking and is compared with his contemporaries. This coincides with the period of negativism and a normal reduction in appetite and food intake. Most children whose parents seek advice have familial short stature but the rest have a wide variety of problems, some of which can be improved after an accurate diagnosis has been made. This article is concerned mainly with growth after the age of 1 year but some aspects of earlier growth have been included to put the topic into perspective.

Growth is a dynamic process and more than one accurate measurement is needed to assess it. Infants under 1 year are weighed naked, but over 1 year children wear vest and pants only. Weight can be measured accurately with minimal skill and cheap equipment. This allows any deviations from normal to be detected within a few weeks during the time of rapid growth—that is, during the first few months of life. Another index is needed for comparison, and until the age of 2 years the head circumference is reliable. After the age of 1 year standing height can be measured, but a precision stadiometer and attention to detail is needed to provide reproducible results. The head must be held with the external auditory meatus and the outer angle of the eye in the same horizontal plane and gentle upward traction applied to the mastoid processes. Two measurements six months apart must be made before the rate of growth can be confidently assessed.

Too thin or too light

A child is usually on a similar centile for weight, head circumference, and height. Children of tall parents tend to be towards the 90th centile and those of short parents near the 10th centile. Most children remain on the same centiles for the rest of their lives. Plotting these measurements on a chart in routine clinics helps to confirm that the child is receiving adequate food and is growing normally. Although birth weight depends mainly on maternal size, some children are more similar to one parent than the other in final size. By the age of 1 year these adjustments have usually been made. If only their weights are recorded children may appear to be either failing to thrive if the father is small or gaining weight excessively if the father is tall. If height and head circumference are plotted as well the series of measurements can be seen to be parallel.

The child who is abnormally thin has lost subcutaneous fat, which is shown by wasting of the buttocks and the inner aspects of the thighs. The growth chart then shows a weight which is on a centile considerably lower than that of the head circumference or height. A child from a family of a narrow body build may show a similar pattern if he is measured only once. But there will be no clinical signs of wasting, and if the measurements are repeated after an interval the increase in weight will parallel that in height or head circumference.

Familial patterns of growth

Most children have a height approximately midway between those of their parents when an adjustment for sex has been made. For boys 10 cm should be added to the sum of the parents' heights and for girls this should be subtracted. Division of this total by two gives the expected adult height for that child. Alternatively the height centile for each parent can be determined from the chart which ends at 19 years, and the child usually has a centile between the two values.

A child with familial short stature will follow the growth pattern of both or one of his parents or another close relative but the diagnosis needs to be confirmed by checking that he is growing at a normal rate—that is, 5 cm or more per year.

Normal rate but atypical patterns of growth

Most infants who grow poorly before birth have a period of “catch-up” growth during the first few months of life. A few, however, continue to grow at the same rate after birth. Although they are short their body proportions are normal but they never reach the normal range for height and weight.

Some short schoolchildren have a family history of similar delay in growth and development, and during the school years the height and bone age are usually retarded. These children may become very distressed towards puberty when they realise that they are not growing as fast as their friends who have a prepubertal growth spurt before them.

Deficient food or malabsorption

Malnutrition from lack of food probably occurs in some of the lower socioeconomic classes in affluent countries as well as in developing countries. Unrecognised poor lactation is becoming more prominent as the incidence of breast-feeding increases. Psychosocial deprivation may decrease the amount of food eaten but is often associated with temporary growth hormone deficiency. Cystic fibrosis and coeliac disease are the most common causes of severe malabsorption, though only one in 2000 children is affected by each of these diseases.

Endocrine problems and other disorders

Children with hypothyroidism may have no distinctive clinical features, and the diagnosis is often delayed. Girls with congenital adrenal hyperplasia are virilised. Growth hormone deficiency should be suspected if the child is extremely short and is below the -3SD line on the height chart. If the child's height is between the 3rd centile and the -3SD line he should be measured again six months later. If his growth curve approaches the -3SD line or he has grown only 2 cm or less he should be referred to a paediatrician.

The mechanism whereby patients with cerebral palsy, uraemia, chronic heart failure, and liver disease fail to grow well is complex, but most of these children have a poor appetite and are likely to have a deficient food intake.

Deficient growth potential of bones

Infants with obvious bone disease such as achondroplasia as well as other children with named syndromes can be recognised by their abnormal appearance and the systems affected. Girls with Turner's syndrome may have no gross abnormalities on physical examination, and leucocyte chromosome studies are needed to exclude this diagnosis.

Referral to hospital

If the child's low height centile is similar to that of a parent or close relative and he has no symptoms or abnormal signs familial short stature can be diagnosed. This should be confirmed by measuring him again six months later and showing that he is growing on a line which is parallel to the third centile—that is, at a normal rate.

Children with any of the following features should be referred to hospital for further investigation.

- (1) Clinical signs of wasting.
- (2) Symptoms such as dyspnoea on exercise or chronic diarrhoea.
- (3) Abnormal appearance or signs of disease such as congenital heart disease.
- (4) Documented evidence of a slow rate of growth (2 cm or less) detected by two measurements six months apart.
- (5) Height below the -3SD line on the growth chart.
- (6) Social problems or deprivation. About a third of children below the third centile who have no physical disease come from severely deprived backgrounds and are not only stunted physically but also retarded in tests of intellectual function. Some of these children are suffering from neglect.

Patients seen in hospital will have their height and weight measured carefully. A radiograph of the left hand is taken to measure the bone age, and blood is taken to estimate plasma urea and thyroxine concentrations. Girls with documented slow growth have blood taken for chromosomal analysis. A sweat test for cystic fibrosis is performed and jejunal biopsy considered. A test for growth hormone after stimulation is performed last because some of the previous conditions may cause confusingly low levels and many paediatricians prefer to estimate the growth rate first.

The growth charts for 2-5 years and 0-19 years were adapted with permission from those described by J M Tanner and R H Whitehouse in *Archives of Disease in Childhood* (1966 and 1975) and published by Castlemead Publications, Hertford (refs 28 and GDG 12A).

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