Chapter 18. Rickets and osteomalacia

Causes and epidemiology

The main feature of both rickets and osteomalacia is a lack of calcium in the bones; rickets occurs in children whose bones are still growing, and osteomalacia in adults who have formed bones. The conditions are, however, caused mainly by a deficiency of vitamin D and not by a dietary lack of calcium. As described in Chapters 10 and 11, vitamin D is obtained both from animal foodstuffs in the diet and from exposure of the skin to sunlight. Vitamin D functions like a hormone in regulating calcium metabolism.

Because the body can obtain adequate amounts of vitamin D from even moderate exposure to sunlight, rickets and osteomalacia are uncommon in most African, Asian and Latin American countries, where sunlight is abundant. Where the diseases do occur, they are usually caused in part by a particular cultural practice or local circumstance. For example, in some Muslim societies women practising purdah wear clothes that cover most of the skin, and they and their babies may rarely leave the household. Rickets is reported in some large, densely populated cities (e.g. Calcutta, India; Johannesburg, South Africa; Addis Ababa, Ethiopia), presumably mainly in children who do not get out in the sunlight. Rickets and osteomalacia are now being diagnosed in immigrant families of Asian origin in the United Kingdom. However, nowhere in the tropics or subtropics is rickets a highly prevalent disease, as it was in Europe in the nineteenth century (see Chapter 11).

Severe rickets usually occurs in children under four years of age who consume only small quantities of foods of animal origin and who for any reason do not have much exposure to sunlight. The bony deformities, however, may be most obvious in older children. Osteomalacia is most common in women who have had several children, who have become depleted of calcium as a result of successive pregnancies and lactation, and who have insufficient vitamin D.

Clinical manifestations

Rickets

Children with rickets, unlike those with most other deficiency diseases, often are plump and appear well fed because their energy intake is usually adequate. The appearance frequently misleads the mother into thinking all is well. The child, however, tends to be miserable, and closer examination will reveal the flabby toneless state of the muscles that causes a pot-belly. Another feature of the disease is a general impairment of normal development. The child is late in reaching all the milestones of early life, such as learning to sit, walking and teething. Other generalized symptoms include gastro-intestinal upsets and excessive sweating of the head.

The main signs of the disease, however, and those on which the diagnosis of rickets is made are bone deformations. The first and main feature is a swelling at the growing ends (epiphyses) of the long bones. This swelling may first be found at the wrist, where the radius is affected. Another classic site is the junction of the ribs with the costal cartilage, where swelling produces a beadlike appearance known as "rickety rosary".

Swellings of the epiphyses of the tibia, fibula and femur may also be seen. In infants with rickets the anterior fontanelle closes late, and in older children a bossing of the frontal bone is found.

Once a child with rickets begins to stand, walk and become active, she or he develops new deformities because of the soft, weak character of the bones. The most common deformity is bow-legs; less frequently knock-knees are seen. More serious, however, are deformities of the spine. Changes in the pelvis, though often not visible, may lead to difficulty in childbirth in women who have had rickets in childhood.

Rickets can be diagnosed from the clinical and X-ray appearance of the bones and by laboratory tests.
Osteomalacia

Osteomalacia is characterized by pain, sometimes severe, in bones, particularly in the pelvis, lower back and legs. Tenderness may sometimes be felt in the shins and in other bones. The patient usually walks with feet rather widely separated and may appear to waddle. Deformities of the pelvis may be obvious. Tetany may occur; it may be manifested by involuntary twitching of the muscles of the face or by carpopedal spasm (in which the hand goes into rigid spasm with the thumb pressed into the palm). Spontaneous fractures may be a feature. Before the deformities are clinically detectable, diagnosis may be made by X-ray examination, which will show rarefaction or decalcification of bones all over the body. Osteo-malacia should not be confused with osteoporosis, a disease of ageing, in which decalcification is also a feature.

Laboratory findings

Levels of vitamin D metabolites and sterols in blood, which can now be measured in sophisticated laboratories, are always very low in cases of both rickets and osteomalacia. Low serum phosphorus and high serum alkaline phosphatase levels are also seen. Usually the amount of calcium in urine will be low.

Treatment

Rickets

The basis of treatment is to provide vitamin D and calcium. Vitamin D may be given as cod-liver oil. Three teaspoonfuls three times a day will supply about 3 000 IU, which is adequate. Synthetic calciferol can also be used. Calcium is best given as milk, at least half a litre a day. Cows' milk contains 120 mg calcium per 100 ml.

Tablets containing vitamin D and calcium are available. One of these may be given twice a day to a child under five years of age, and one tablet three times a day to an older child.

While the child is being treated, the mother should be educated regarding the value of sunshine. Rickets, unless severe, is not usually a fatal disease per se, although the child may be more prone to infectious diseases.

Mild bone deformities tend to right themselves with treatment, but in more severe cases some degree of deformity may persist. One of the more serious consequences is obstructed childbirth due to pelvic abnormalities, which may necessitate Caesarean section in hospital.

Osteomalacia

The treatment of osteomalacia is similar to that for rickets. A dose of 50 000 IU vitamin D should be given daily as cod-liver oil or in some other preparation. Calcium should be provided either as milk or, if milk is not available, in some medicinal form such as calcium lactate.

In women with pelvic deformity regular antenatal care is essential, and in some cases Caesarean section before term may be necessary.

Prevention

The prevention of rickets and osteomalacia will depend on the reasons for their occurrence in the particular communities where they are now seen. Usually there is a cultural or environmental cause which may be locally specific and which may need particular attention.
**Rickets**

Measures should be taken to ensure that all children get adequate amounts of sunlight. In temperate climates such measures include slum clearance; smoke abatement; the provision of parks, playgrounds, open yards and gardens; and regular outings for the young.

Children should have adequate calcium and vitamin D in their diets. Milk and milk products are especially valuable.

Where it is not possible to expose children to adequate sunlight, vitamin D supplements such as cod-liver oil should be given.

Children should attend clinics regularly so that early diagnosis of rickets can be made and curative measures taken.

Nutrition education should be provided regarding the needs for calcium and vitamin D and the methods by which adequate amounts of them can be obtained.

**Osteomalacia**

The body should be exposed to adequate sunlight. (This need may conflict with religious or social customs, e.g. those requiring women to be heavily covered or veiled, or those forbidding women to go out in public.)

It is important to ensure that a diet containing adequate quantities of calcium and vitamin D is consumed, especially by pregnant and lactating women.

Clinics or home visiting should be established to allow examination of pregnant and lactating women and, where necessary, to issue cod-liver oil or other vitamin D supplements. Advice should be given regarding the consumption of calcium-rich foods. Sometimes medicinal calcium (e.g. calcium lactate) will have to be prescribed.

Nutrition education should be provided, and it should include the topic of child spacing.