Chapter 19. Vitamin C deficiency and scurvy

Causes and epidemiology

Dietary surveys in many countries in Asia, Africa and Latin America indicate that large segments of their populations consume much lower amounts of vitamin C than is considered essential or desirable. Nevertheless scurvy, the classical and serious disease that results from severe deficiency of vitamin C, now appears to be relatively uncommon. No country reports scurvy as a major health problem, but outbreaks are seen in refugee camps, during famines and occasionally in prisons.

Scurvy was first recognized in the fifteenth and sixteenth centuries as a serious disease of sailors on long sea voyages who had no access to fresh foods including fruits and vegetables (see Chapter 11). Before the era of vitamin research it became practice in the British navy to provide limes and other citrus fruit to prevent scurvy.

Vitamin C or ascorbic acid is an essential nutrient and is necessary for the formation and healthy upkeep of intercellular material (see Chapter 11); it is like a cement that binds cells and tissues. In scurvy the walls of the very small blood vessels, the capillaries, lack solidity and become fragile, and bleeding or haemorrhage from various sites results. Moderate vitamin C deficiency may result in poor healing of wounds.

As discussed in Chapter 13, vitamin C enhances the absorption of iron and thus has a role in reducing iron deficiency anaemia.

Some oral contraceptives lead to lowered plasma vitamin C levels.

Clinical manifestations

The following symptoms and signs may occur:

· tiredness and weakness;

· swollen gums which bleed easily at the base of the teeth;

· haemorrhages in the skin;

· other haemorrhages, e.g. nosebleeds, blood in the urine or faeces, splinter haemorrhages below the fingernails or subperiosteal haemorrhages;

· delayed healing of wounds;

· anaemia.

A patient who has scurvy and exhibits some of the above symptoms, though not appearing very seriously ill, may suddenly die of cardiac failure.

Although scurvy is a relatively rare disease, swelling and bleeding of the gums occur fairly frequently in certain regions and may be due to vitamin C deficiency. Subclinical vitamin C deficiency may also result in the slow healing of wounds or ulcers. Patients who are to undergo surgery should be given vitamin C if they may be deficient.

Vitamin C deficiency may also contribute to anaemia in pregnancy.
Infantile scurvy (Barlow's disease)

Scurvy sometimes occurs in infants, usually aged two to 12 months, who are bottle-fed with inferior brands of processed milk. During the processing of the milk, the vitamin C is frequently destroyed by heat. Good brands of processed milk are fortified with vitamin C to prevent scurvy.

The first sign of infantile scurvy is usually painful limbs. The infant cries when the limbs are moved or even touched. The child usually lies with the legs bent at the knees and hips, widely separated from each other and externally rotated, in what has been termed the "frog-leg position". Bruising of the body may be seen, although it is difficult to detect in darkly pigmented African skin. Swellings may be felt, especially in the legs. Haemorrhages may occur from any of the sites mentioned above, but bleeding does not take place from the gums unless the child has teeth.

Diagnosis and laboratory tests

The capillary fragility test is not specific for scurvy but may be useful. It is simple to perform in any health facility. The cuff of a blood pressure machine or sphygmomanometer is placed around the upper arm. It is inflated to a pressure approximately midway between the subject's systolic and diastolic pressure (perhaps 100 mm Hg) and left in place for four to six minutes. In a positive test, numerous small red spots appear in the skin below the cuff; these are petechial haemorrhages arising from capillary fragility. The test is a little more difficult in very dark-skinned people, but usually the anterior surface of the lower arm is pale enough for recognition of petechial haemorrhages.

Ascorbic acid levels can be determined in blood plasma or in white blood cells. These levels provide evidence of body reserves of vitamin C. If the level of ascorbic acid in either the blood plasma or the white blood cells is within the normal range, the condition almost certainly is not scurvy.

In infantile scurvy X-ray examination will reveal periosteal haemorrhages, which together with clinical signs provide the diagnosis.

Treatment

Because of the risk of sudden death, it is inadvisable to treat scurvy with only a vitamin C-rich diet. It is advisable rather to give 250 mg ascorbic acid by mouth four times a day as well as to put the patient on a diet with plenty of fresh fruit and vegetables. It is only necessary to inject ascorbic acid if the patient is vomiting.

Increased intake of vitamin C with meals can have a manifest effect on the absorption of iron. In many iron-deficient populations, increasing vitamin C intake will help reduce the incidence and severity of iron deficiency anaemia.

Prevention

Vitamin C deficiency can most easily be prevented in all societies by consumption of adequate amounts of fresh foods, particularly generous intakes of fruits and vegetables, including green leaves. Guavas and various other tropical fruits, for example, are high in vitamin C. (These foods are described in Chapter 28, and the vitamin C content of foods is given in Annex 3.)

Recommended preventive measures are as follows:
· increased production and consumption of vitamin C-rich foods, such as fruit and vegetables;

· provision of vegetables, fruit and fruit juice to all members of the community, including children, beginning in the sixth month of life;

· provision of vitamin C concentrates if for any reason the previous two measures are not possible;

· improved horticulture, including the provision of village and household gardens, orchards and vegetable allotments in towns and school gardens;

· encouragement of the wide use of edible wild fruits and vegetables known to be rich in vitamin C (e.g. amaranth, baobab fruit);

· action to avoid and discourage the replacement of fresh vegetables, fruit and other foods by canned and pre-served foodstuffs, and encouragement of the greater use of fresh fruit and juices in place of bottled products;

· nutrition education, which should cover the reasons and need for eating fresh foods, and instruction in means of minimizing vitamin C loss in cooking and food preparation.