

## INJURIES OF THE JAWS AND DIETARY TREATMENT.

BY MAJOR E. H. C. CAUTE,

*The Army Dental Corps.*

MOST dental surgeons are more or less familiar, either in actual practice or in theory, with the *local* treatment of the various types of jaw injuries. They know of, and may practise in conjunction with the surgeon, splint work, intermaxillary wiring and bone grafts. But the more remote treatment, that is the revitalization of the damaged tissues, is most often entirely neglected. Healthy tissues spring from within, and perfect body metabolism is all important. Most surgeons are likely to neglect this important fact when giving treatment for a damaged, unhealthy or septic condition. Proper dietary management will ensure not only a general feeling and condition of well-being and a brightened mental outlook, but above all provide an adequate supply of those vital materials which are essential for the recovery of the damaged tissues.

In jaw injuries the body metabolism is readily upset if the patient is deprived of the power to masticate and to prepare his food for digestion. Every effort must be made to prevent this upset. Where mastication is not possible, then the carbohydrates could with advantage be reduced, as there can be no aid to digestion in the mouth and consequently acidosis may occur, giving rise to unpleasant symptoms. In connexion with this, it is interesting to note that takadiastase is a useful natural aid to carbohydrate digestion. This modification of the normal diet is slight, and the basic principles of the normal, well-balanced diet should not be altered. The body needs then :

### A. *For General Health.*

- (1) *Proteins*—for body building and tissue repair.
- (2) *Fats*—for concentrated storage of fuel food, for energy.
- (3) *Carbohydrates*—for immediate energy requirements.
- (4) *Mineral salts*—for structure of special tissues and also for important functions.
- (5) *Vitamins*—for regulating the healthy metabolism of the body.
- (6) *Water*—for normal physical and chemical processes, such as digestion, excretion, etc.

The proportion of the first three constituents in the average diet should be 1 of protein, 1 of fat, and 4 of carbohydrates (dry weight). The inclusion of the correct type and quantity of each mineral salt required (as far as is known) is as vital to health as the known vitamins with their calculated minimum requirements, a fact commonly overlooked. Some relevant details are given below.

B. *For the Repair of Jaw Injuries.*

While making every effort to supply, even though in a modified form, the above substances, the special requirements of certain tissues in this connexion must be noted, viz.:

(1) *For Mucous Membranes.*—Vitamin A is essential for the proper functioning of mucous membranes. Deficiency of this vitamin in the diet results in keratinization, with a subsequent insufficiency of secreting fluid. Especially is this so with the epithelium of the gums at the junction with the teeth, where it may become overgrown and infected with micro-organisms, causing pyorrhœa. A diet rich in vitamin A is more effective in clearing up this condition than the application of antiseptics. It has been noted also that vitamin A is essential for the proper formation of dentine and enamel, and on a deficient diet the teeth become chalky and brittle.

The principal sources of this vitamin are the fish liver oils, green vegetables (thin dark green leaves being the richest), carrots, ripe red tomatoes, liver, fish roes, butter, etc.

(2) *For the Gums.*—A gross deficiency of vitamin C in the diet results in scurvy. One of the typical symptoms of this disease is a weakness in the walls of the blood vessels, resulting in hæmorrhages. Particularly is this marked in the gums, where soft spongy swellings sprout up between the teeth. There is also ulceration, accompanied by osteoporosis, and a loosening of the teeth. A minimum daily requirement has been calculated, and the chief sources of this vitamin are citrus fruits, spinach, watercress and cabbage, and ox liver.

(3) *For the Teeth and Bones.*—As stated above, vitamin C deficiency results in dental decay. This is a result of the breakdown of the different types of cells, concerned in the development of dentine, enamel, cement pulp, and also the bone of the jaw. These degenerative changes have been explained as follows :

The special action of this vitamin has been considered to be the production and maintenance of intercellular material, which cements the individual cells into an organ. In its absence failure to do this causes the mineral salts to drain away from the bones and teeth. The importance of this vitamin cannot be unduly stressed.

The mineral salts required are those of calcium and phosphorus and in the correct ratio. An adequate supply of these is essential for bone and teeth structure, and incidentally enhances general vitality. The majority of diets are deficient in these mineral salts.

The chief sources of calcium are cow's milk (cheese), green vegetables, egg yolk, sardines, tinned salmon, bloaters, rhubarb, blackberries, pulses, whole wheat bread, etc.

The average adult daily requirement is 0·8 gramme of calcium.

The average adult daily requirement of phosphorus is 1·3 grammes.

This gives a Ca/P ratio of 0·6.

The chief sources of phosphorus are cheese, egg yolk, offal (liver, sweet-breads, etc.), herring roes, sardines (whitebait and sprats), blackcurrants, etc., green peas, spinach, etc., dried apricots and peaches, oatmeal, whole rye and wheat.

In order to ensure the proper deposition of these minerals in the teeth and bones, vitamin D is essential. It acts by maintaining the proper and optimal level of these minerals in the blood, so that the enzyme at the site of bone-forming tissues can cause precipitation, and so deposition in the proper tissues. Incidentally and importantly, an excess of this vitamin is harmful, since it raises the blood level of calcium. This may be high enough to cause precipitation of calcium phosphate without the aid of the localized enzyme, and so result in deposition in other tissues, such as kidneys, lungs, etc.

On the other hand, a shortage of this vitamin will result in a fall in the blood level and so a subsequent shortage reaching the bone-forming tissues. The result of such a deficiency, in addition to dental decay and osteomalacia, would seriously delay healing of these tissues in injuries. The principal sources of this vitamin are the fish liver oils, egg yolk, butter, ox liver, canned salmon, etc.

Having the above outstanding requirements in mind, it is essential that the food presented to the patient be correctly cooked (to avoid destruction of vitamins and loss of mineral salts), appetising, varied and hot, not luke warm. Good meals have a cheering effect on the patient, who is often greatly depressed by an anxiety and fear that his injury will result in some degree of permanent facial deformity. With the aid of scientific feeding and good nursing the patient's recovery will be greatly accelerated, and he will give his entire co-operation to the work of the surgeons.

The well-known methods of feeding are by means of: (1) Cup and bowl—for liquid or soft diet; (2) Spoon feeding—for liquid or soft diet in those cases where the patient has lost the use of lips and surrounding tissues; (3) Nasopharyngeal—for liquid diet in those cases of extensive loss of tissue of the floor of the mouth; (4) Rectal feeding—for liquid diet in those cases where the patient is unable to swallow, or is suffering great shock.

The actual preparation of the food for the above methods of feeding may be divided into two classes, namely a liquid preparation and a soft preparation.

(1) *The liquid preparation*, making a total of about 2,000 calories a day, must always be given to those patients with fixed intermaxillary wiring or splints.

*Soup* must be strained.

*Vegetables* must be cooked and made into a very fine *purée*, or better still given in a form such as the well-known brands of homogenized foods. N.B.—Libby will supply an analysis showing vitamins and mineral contents.

*Meat*, including liver, must be finely sieved.

*Fruit* should as a rule be cooked if fresh or dried, and then made into a *purée*. If tinned, it should not be cooked but made into a *purée*.

*Drinks* may consist of tea, milk, orange juice and fruit juices.

*Note*.—The soup may conveniently be used as a vehicle to convey to the patient the more solid *puréed* particles of vegetable and meat.

(2) *The soft preparation*, making a total of about 2,500 calories per diem, allows a little more latitude.

*Soups* need not be strained unless of the vegetable type.

*Vegetables* must be made into a *purée*.

*Fish* such as herring, salmon, and bloater, must be carefully freed of bone and finely divided.

*Meat* must be ground.

*Eggs* can be made into an omelette, scrambled or soft boiled, although the latter are apt to stick to splint work.

*Bread* should be given in the form of fresh whole wheat crumbs, or crumbs made from the many varieties of whole wheat biscuits which are obtainable.

*Fruit* can be given in the form of tinned fruit (only the best brands should be used, to ensure maximum amount of vitamin C), stewed fresh fruit (stewed in as short a time as possible, to avoid undue loss of vitamin C), choosing those with a high calcium and phosphorus content.

*Drinks* as described in the liquid preparation.

To those dental surgeons of the Services who intend to avail themselves of a knowledge of dietetics to aid them in their work, I suggest that it is absolutely essential to instruct the nursing staff, otherwise results may be disappointing. The subject is a fascinating one, and links together a number of medical subjects of which they have knowledge. It should be a simple matter to arouse their interest, and the result will be intelligent co-operation and a shelving of some methods of invalid feeding, the results of which few *healthy* people could survive.

To the necessarily brief outline, given above, the following details are of interest :

(1) Since vitamin A is manufactured by sunlight in the green plant, the amount is proportional to the exposure, thus thin dark green leaves (e.g. spinach) are richer than the pale inner leaves of cabbage, lettuce, etc. This vitamin is stored in the liver of animals, which is thus a good source, provided the animal's food contains vitamin A or its precursor. This fact also explains its presence in such concentrated amounts in fish liver oils, since some authorities have suggested that green algae are the primary source and are eaten by small fish, and these in turn by larger fish, and so on until the concentrated vitamin reaches the cod, halibut, etc.

Vitamin A being fat soluble is found in milk, and concentrated in its fat, i.e. butter. This amount varies, and depends on the diet of the cow. Thus summer butter is better than winter, and imported butter from grassy countries, for example New Zealand, is often to be preferred. The colour is no guide to the vitamin content as was thought at one time.

(2) Vitamin D is of special interest, and peculiar in that an excess dose is harmful. A classic story often quoted is of the over-zealous mother, who thought that if a little was good a lot would be much better. The result was fatal, causing almost complete calcification of the lungs of her child.

The relationship between this vitamin and sunlight is also of great interest. The vitamin can be manufactured under the skin from a precursor by exposure to sunlight. This is one explanation for the prevalence of rickets in slums, and among women living in purdah. The value of sunlight having been successfully demonstrated for some time, yet another warning must be given of the dangers of too sudden or over exposure, since the active principle, namely the ultra-violet rays, is harmful to the lens of the eye, and the toxic effect of skin burns is too well known to be repeated.

(3) Vitamin B, which is important for digestion and general health, is mostly lost in the milling of flour. Incidentally, the calcium content is reduced to about two-thirds at least of the total. The same fact applies to the polishing of rice and other cereals. The vitamin B content of wholemeal bread is about six times that of white.

The fascinating story of the slow deterioration of the teeth of the inhabitants of the island of Tristan da Cunha is correlated with the increased consumption of white flour and sugar, as a result of more visits to the island of steamers, which at one time called only twice a year (when 83 per cent of teeth were free from caries). A comparison of the teeth of Maoris and New Zealanders is a telling indictment against the use of white flour, which has had its calcium content depleted during its manufacture.

On no account should 'white flour, polished rice (or any other cereal from which the embryo or germ has been removed), or foods made from these, be allowed in the dietary of hospital patients.

Since the habit of eating white bread results in the widespread incidence of digestive disorders (due to shortage of vitamin B) and almost universal incidence of some form of dental decay (due to the loss of mineral salts) in so called healthy people, how much more vital is it to supply these factors to patients attempting to regain health.

(4) Although Dr. James Lind's famous "Treatise on Scurvy" appeared in 1755 and Sir Richard Hawkins had made valuable observations as far back as 1593, yet there are few people to-day who recognize the relationship between scurvy and diet. The Navy took advantage of the information and in 1795 issued an ounce of lemon juice per man per day. The Mercantile Marine followed later. Yet in the Great War, the tragic story of General

Townshend at Kut in 1915, and the occurrence of 11,000 cases of scurvy in 1916, brought sharply to the minds of the controllers of the nation's food supply the disastrous effects of continuing to ignore the warning of scientists against fatal reductions in certain essential foodstuffs.

From its beginning in December, 1916, till its end in May, 1917, the Ministry of Food failed in its task. Luckily the warning against the stoppage of imports of fresh fruit was not entirely ignored. Scurvy is apt to be the result of an unscientific or careless organization of food supplies on a large scale, since this vitamin is extremely sensitive, viz. it is very easily oxidized. In fact the vitamin content of fresh lemon juice which is high, rapidly deteriorates on standing alone. Also it is destroyed by the addition of alkalis, such as soda, used so commonly in the cooking of green vegetables. Incidentally, rapid cooking is better than slow cooking, since the oxygen is quickly driven off, and there is likely to be less oxidation and so less loss of the vitamin. The less cooking, the better, of course. Yet, canners claim that the preservation of fruits and vegetables *in vacuo* preserves the vitamin C since the contents are heated in the absence of oxygen. Practical observations by a scientific body, working for the French Government, tend to confirm this claim.

Yet vitamin C is easy to obtain. In emergency, the pure extracted vitamin (ascorbic acid) could be used. Fresh citrus fruits contain high percentages. It is interesting to note the high value of fresh paprika, parsley, and horseradish, which thus make a valuable as well as attractive garnish to invalid diets. Dried fruits and vegetables contain practically no vitamin C, yet sprouted seeds, e.g. dried peas, rapidly regain a good amount. A shortage of vitamin C in the body of a patient is easily detected, since the vitamin is excreted in the urine, and is easily estimated by chemical means, and there is a subnormal figure in these cases. A large dose given, say in the form of fresh orange juice, would not show an increase excreted equal to that in a normal control patient, since a certain amount is retained in the body up to a certain level. This technique could be adopted as a valuable check on hospital diets.

Finally, if it can be said that "an army marches on its stomach," how equally important it is to ensure the most rapid recovery of our casualties by using every available bit of knowledge known up to date.

Let us not lag behind the intelligent layman in putting into the front rank the most neglected yet vital aid to health and recovery. We must not repeat the errors due to ignorance, which resulted in such tragic lessons as Kut; and it must be remembered that the German Government lost the last war largely because they preferred "guns to butter."