

fluid; a false joint, either ball and socket, or hinge-like is developed. Instead of terminating in a false joint, the ends of the fragments may become atrophied and pointed, or die.

The causes of deficient, imperfect repair are principally local. Among the general causes you will find syphilis, diabetes, scurvy, Bright's and other diseases mentioned in your text-books. These may, in a small proportion of cases, be somewhat associated with the cause. No doubt they are; but the connection between cause and effect is not always clear. Of the importance we must attach to the causes of local origin there is no room for doubt, because from them we learn a lesson of prevention, which is better than cure.

Should the fragments be kept far apart, whether by muscular action or by the interposition of muscle, tendon, fascia, joint-capsule, or a large blood-clot, it is certain that bony union will be prevented. It is common to meet with these conditions, and they ought to be rectified by the surgeon in charge.

The second most usual cause is also frequently chargeable to the attendant. It is the imperfect fixation at the seat of fracture. Motion is allowed, and union fails to take place. The imperfect coaptation and mobility not unfrequently combine to defeat the desired repair. To properly reduce a fracture, and keep it reduced, prevent these two most common causes of imperfect, deficient repair of bone.

Mal-nutrition, due to a rupture of the nutrient artery, to too tight bandaging, ligature of the main artery, or venous thrombosis, is sometimes a cause; and necrosis, caries, hydatids, sarcoma and chronic abscesses may prevent union.

In compound fractures failing to unite, I believe the most usual additional cause is suppuration, and it, too, is preventable.

TREATMENT.

The treatment is both constitutional and local. I shall only refer to the latter. Following up the line of treatment already mentioned in connection with delayed union, should rubbing the ends together and percussion fail, I should more efficiently stimulate them with a bone-drill or common brad-awl, making a number of perforations in each. It must not be forgotten that strict antiseptic

measures must be taken in all operations on bones. Punching holes through the broken fragments cannot, of course, be undertaken without an anæsthetic, and while the patient is insensible, the joints should be freely moved.

There is not much danger of ankylosis short of three months, and a little passive motion is sufficient to prevent it. It is not good practice to use passive motion before the termination of four or six weeks in upper extremity, and six to eight in the lower. You may think you are moving the joint, when in reality you are only disturbing the fracture, and your meddlesomeness may prevent bony union. Leave it alone, once it is put up in splints or otherwise. The bone will unite before ankylosis can take place. Joints that have been perfectly fixed for six or eight weeks are very easily moved under chloroform, and when operating for non union, they can with impunity be put at rest in a slightly altered position for six or eight weeks longer. The treatment by puncturing is suitable in delayed union, in absolute non-union with the fragments in close apposition, and in fibrous union, where the tissue is but small in amount and the bones not far apart.

For the more difficult cases, pegging, wiring, resecting and nailing are indicated, and when these have proved unsuccessful, transplantation or grafting of bone may be tried.

While our patient is taking ether, I shall have time to speak of two cases in point in which resections, wiring, pegging and nailing have been successfully resorted to.

Case 1. Ununited fracture of the femur of five months' standing; caries of the upper fragment; two inches resected, wiring and pegging. The case successful. Mr. G. H., aged 34 years, admitted to the hospital in October, 1889. Five months previously his right femur was broken at the junction of the middle and lower thirds. The limb below the injury was still somewhat swollen and œdematous. The slightest passive motion gave rise to pain. Sometimes it was painful at nights. By rubbing (as we supposed) the ends of the fragments together, an indefinite grating could be felt. The limb was two inches shorter than the opposite one, and he was unable to move it. His pulse and temperature normal; appetite good; bowels slightly constipated, and slept fairly well at nights. He