

massage. The results observed up to two and one-half years post-operative have been very good, and are in direct proportion with the thoroughness of the operation. Microscopic examination shows that the disease does not affect the whole fascia, but only and always very circumscribed areas, which are often scattered, and are recognizable by the small swellings they form. A very few vessels and nerves pass through the normal fascia, following the interstices of the connective-tissue bundles. New cellular tissue with marked proliferative tendency is to be seen in the connective-tissue spaces spreading between the connective-tissue bundles and separating them.

The nuclei of the invading cells are large, spindle-shaped, and broad in the middle. This new tissue changes, shrinks, and contains many elastic fibres. Remains of old or recent hæmorrhages are frequently seen. There is a great increase in the number of capillary blood-vessels, and one sees that the neoplastic cellular tissue arises from the new-formed adventitial sheaths of vessels. There is a great hypertrophy of the walls of the larger vessels. The connective tissue of the nerves is increased. Nerve degeneration is a secondary phenomenon. As a result of his investigations, the author assumes that there is a local tendency to connective-tissue hypertrophy in the hand, and that as a result of circulatory disturbances contraction follows. Probably the influence determining the hypertrophy reaches the palm *via* the blood-vessels, but what this ultimate cause is, remains unproved. One cannot yet assume any specific cause of the disease, such as uric acid diathesis, bacterial products, etc. Nervous influences certainly do *not* play the rôle ascribed to them by individual neurologists, and the influence of traumata may be excluded.—*Archiv für klinische Chirurgie*, Band lxxvii, Heft 4.

## BONES.

**I. The Primary Suture of Fractures.** (Discussion at the Congress of the Deutsche Gesellschaft für Chirurgie of 1902.)

F. VÖLCKER (Heidelberg) said that experience in the Heidelberg clinic shows the indications for the operative treatment of subcutaneous fractures to be limited.

The danger from infection is slight in operation when the bone is easily accessible, *e.g.*, in the tibia. Asepsis is less certain when the bone lies deep, *e.g.*, femur, and especially in epiphyseal fractures.

Suture of fractured bones usually leads to delay in consolidation, and occasionally to sinus formation and subsequent overriding of the fragments. The principal field for primary operation is in cases of complicated fracture where the exact application of a dressing is very difficult, and treatment is much simplified by fixation of the fractured ends.

Hope in the treatment of subcutaneous fractures lies, not in the domain of operation but in improved means and methods of dressing. Where such cannot be obtained, the question of suture arises, especially in the young, but the value of suture in fractures of the diaphyses is lessened by the fact that it delays consolidation. Two fractures existing at the same time in the same limb are best treated by operation.

Unfortunately, bone suture is most difficult in those cases where improvement in our results is most necessary, *viz.*, in fractures involving articulation.

W. ARBUTHNOT LANE stated that he had, for many years, watched the effects produced by the carrying out of various trades and handicrafts on the bones and joints of the workmen. From an examination of the skeleton alone he can even distinguish that of one who has been a coal heaver from that of a coal trimmer. The bones and joints develop peculiarities to suit the needs of the individual, and may thus deviate far from the accepted normal. From a very extensive study of old fractures, seen in the dead house, Lane has noted two facts specially: (1) that the re-establishment of continuity and the repair of the bone is very unsatisfactory and incomplete; and (2) that just as the peculiarities of

various trades lead to alterations in articulations, so do faults in the reposition of fractures, causing more or less angular union, lead to abnormal lines of pressure acting on the joints and consequent deformity. The amount of joint deformity varies with the amount of angularity at the line of union, and also with the age of the patient at the time of injury. In the young the epiphyseal line will form bone abnormally, and thus modify the articular end, so that after a short time the function of the joint may be carried on effectively and painlessly. This occurs under the law that "the degree of bone formation in the different parts of an epiphyseal line varies with the pressure exerted on it." After the diaphysis and epiphysis have been united and up to about the thirty-fifth or fortieth year, alterations in the mechanism of a joint lead to definite changes in its form due to formation of new bone and cartilage or to absorption of old bone. After this period of life unusual pressure leads to destruction of articular cartilage and the underlying bone, followed by the formation of new bone at the margins of the articular surfaces. Persuaded by the above observations, made in the dead house, that the results of treatment in fractures are unsatisfactory, the author examined a large number of hospital patients with fractured lower limbs with regard to their mechanical and æsthetic disability as well as to the financial loss they incurred through their accident. He found that the opinions commonly held by surgeons as to the effectiveness of manipulations and splints are ridiculously false. The financial loss to the patient entirely depends on his business, often in masons, decorators, and sailors amounting to compulsory and complete change of work. What factors render it difficult and often impossible to obtain good results? Up to the present it has been taught in England "that if the fragments of a broken bone are not brought into correct apposition, the surgeon has not done his work methodically," and that it is the spasmodic contraction of the muscles on the broken bones which hinder their reposition.

It is clear that both these ideas are wrong. The first is shown

incorrect by Lane's researches on both the living and the dead who had been treated in the great hospitals of London; the second from the fact that the muscles are relaxed in complete anæsthesia, and yet it is impossible to place the broken bones into their normal form.

The author opines that the muscles and soft parts around a tubular bone form in their length rigid nodes, and that the resistance, which prevents accurate reposition of the fragments, is caused by a shortening of these nodes through hæmorrhage, and later through inflammatory changes. The resistance to correction is directly proportionate to the extent of the hæmorrhage and inflammation. Apart from operation only two methods of treatment are therefore proper. These consist in reduction by manipulation, if reduction thus is possible before hæmorrhage has occurred, or in waiting until the effused blood is absorbed and the inflammation has gone down. To the latter plan the objection holds that the soft parts rapidly shorten and cannot afterwards be lengthened. The author believes that complete restoration of form in cases of fracture with longitudinal over-riding of the fragments is only possible by the aid of an operation, and that this is more frequently required in the lower than upper extremity. Lane applied this principle at once to the treatment of simple fractures. By applying strong extension to the leg and by using levers and strong bone forceps, he was able to get exact apposition of the fragments of the tibia and fibula even when the amount of effused blood and the inflammation were considerable. Far less force was required to attain the same result in fractures of the femur and of the upper extremity.

Lane's researches show that text-book descriptions of fractures are incorrect in almost every particular. Bones fractured by direct violence show transverse or more or less oblique fracture surfaces and are often splintered. Those broken by indirect violence are always spiral, each fragment ending in a long sharp point. The chief difficulty in reducing spiral fractures of the

tibia and fibula lies in the fact that they are double, and the two breaks do not correspond. In most cases correction of the fracture of the tibia by operation permitted the fibula to resume its normal shape, and the latter bone did not require to be exposed.

To maintain apposition, thick wire of pure silver or ordinary joiner's screws were used. To avoid danger of infection from the use of fingers in the wound, the bones were very freely exposed by a very long incision, and were manipulated with instruments. Unless the asepsis is perfect, the wire or screw nails act as foreign bodies.

Operations on recent fractures are child's play compared to those on badly united and corrected breaks, *e.g.*, when two bones, as the tibia and fibula or radius and ulna, must be divided in four different directions before the correct axis of the two bones can be attained.

FRITZ KÖNIG (Altona) claimed that exact apposition is not of such supreme importance for obtaining good function. He demonstrated the skiagram of a cured leg fracture where there was marked dislocation, yet an excellent functional result. While this is true of fractures of the shaft, it is otherwise in those involving or close to the joints. The shortness of the fragments renders reposition and retention difficult and poor results common. The advantages of bone suture are close approximation, avoidance of extensive callus (very important in articular fractures), and the possibility of moving the injured member at a very early date (from the third week). The last is of special moment in those past their youth. In the neighborhood of joints the result is often faulty, rarely because of pseudarthrosis, more frequently because of restricted field of joint motion. Severe crushing fractures are followed by excessive callus and a bad result. All these forms often call for a late operation, of which the technique is difficult and the functional prognosis is bad, while early operation is easy and gives good prospects. Good skiagrams give information as to the changes of bad or delayed union, and hence indications for early operation.

In one case of elbow-joint and five of shoulder-joint injury, he began by non-operative treatment, but as the result of examination of a skiagram taken five days later he operated at the end of the first or in the second week.

In two of the shoulders the destruction of bone was so great that resection was performed. The result of bone suture was demonstrated in a man of forty-two years, with an oblique torsion fracture of the tubercle region of the humerus with abduction of the proximal fragment; the biceps tendon was hooked on the point of the lower fragment. Motion was begun in the third week, and in the fourth week the arm was used in swimming. Röntgen rays showed complete reposition.

König obtained recovery by operation without much callus and with good function in a boy of fourteen who had sustained an oblique fracture of the external condyle of the humerus with subluxation of the forearm bones upward, backward, and outward.

TRENDELENBURG (Leipzig) only operates in fractures involving or close to joints. In fractures of the hip he introduces a screw through the trochanter into the head.

PFEIL-SCHNEIDER (Schönebeck) said that ten years ago he advised primary suture in fractures to the Congress. Screws have the disadvantage that they do not heal *in situ*. Silver wire almost always heals, but is not firm enough. He had treated twenty-nine cases with silver wire and six with screws. The latter presented slow consolidation and little new formation of bone, so that in one case the first attempt at walking caused a new fracture.

KÖRTE (Berlin) disapproves of primary operation in fractures being proclaimed a general principle. It can only be proper when other means are contraindicated.

HENLE (Breslau) spoke of the defective consolidation after primary suture, especially in the diaphyses. The results are better in fractures of the epiphyses. In Breslau, fractures in the neighborhood of the joints are treated by extension, and massage is generally begun after nine days. The functional results are very good in spite of deficient anatomic restitution.

LAUENSTEIN (Hamburg) drew attention to radial paralysis following oblique fractures of the humerus with much displacement. Spiral fractures exist which cannot be reduced. Such breaks require suture. Silver wire is only serviceable in the patella. For other cases he recommends Hansmann's screws, having used them in more than sixty cases. He has never noticed a protracted formation of callus; after four weeks the screw is loose and is removed. The duration of treatment is lengthened both when screws or wire are used. The speaker gave a warning against early massage.

SCHEDE (Borin) uses ivory pegs in intracapsular fractures of the hip. He has used iron and gold nails for the same purpose. He has given up the use of aluminum bronze.

SCHLANGE (Hanover) warns against too frequent operation. According to circumstances, he operates in fractures of the patella and olecranon and in articular fractures complicated with dislocation.

BIER (Greifswald) drills the fragments and leaves the drill *in situ* as a nail. Suture he rarely uses. In fracture of the neck of the femur no dressing should be used, the patient being merely laid in a proper position.

KOCHER (Bern). Suture in fractures of the diaphysis is exceptional. In those of the apophyses, *e.g.*, tearing loose of the tuberculum majus, operation is the rule, and the same is frequently true in epiphyseal fractures, especially in children. Operation is eminently proper in fractures at the elbow. It does not matter what material is used for suture,—silver, silk, or screws.—*Verhandlungen der deutschen Gesellschaft für Chirurgie; Centralblatt für Chirurgie*, July 20, 1902.

JOHN F. BINNIE (Kansas City).