

# A short review of bone surgery: fractures and their treatment

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**I**n the last decade of last century and in the first of this the great development of operative surgery drew the surgeon's attention from the treatment of fractures. Arbuthnot Lane is the man who aroused the surgeons of Britain from their lethargy in this direction, by his insistence on the desirability of treating fractures by open operation.

A commission of British Medical Association was set up in 1910 to investigate the late results of fractures treated by the old method of setting and immobilisation by splints, and of the newer methods of massage and mobilisation and open operation. The verdict of this committee, given in 1912, was a revelation to surgeons for so high was the percentage of ultimate bad results of the conservative methods that confidence in them was rudely shaken. Cases treated by Lane's operative method gave the best result. A strong fillip was thus given to the method, and it was largely used by surgeons in all parts of the world. On the other hand, the Liverpool school, with Robert Jones at its head, continued to follow and develop the principles laid down by Owen Thomas for treatment of fractures by means of careful "setting" under deep anaesthesia, and the maintenance of fragments in true alignment by means of extension and immobilisation of the limb in the special splints with the name of Thomas is associated.

Both methods of treatment have a common aim, that of the replacement and maintenance of the broken fragments in accurate apposition, perfect anatomical restoration. The Fracture Committee stated that "there is a clear interdependence in fractures between the anatomical and the functional result. If the anatomical result is bad, the functional is bad in more than 50 per cent of cases. If the anatomical result is good the functional is good in 90 per cent." Therefore, the most certain way to attain a good method, whether operative or non-operative, which does not definitely provide a good anatomical result, should be accepted as a method of choice.

The war did more than anything else could have done to bring about the developments in the

treatment of fractures. The conventional methods of putting up fractures were soon shown to be thorough ineffectual, and many ingenious forms of apparatus were devised, some simple, and some most complicated. From the contest for superiority, the Thomas splints and their modifications emerged easily first on account of their simplicity, the comfort which they gave the patient in transport, the ready access for the dressing of wounds, and the good control which could be exercised over the broken fragments. These splints were adapted to the upper limbs as well as lower, and were fitted with attachments for the suspension to overhead bars. The lessons learnt in the war hospitals are only slowly being applied to civil practice. Particularly is this the case with regard to the Thomas splint, which should be the standard splint supplied in ambulance outfit, and its methods of application routine teaching in first-aid classes.

We may consider our general treatment of fractures under three main headings:—(1) Massage and mobilisation; (2) splint and extension; (3) operation. They cannot be looked upon as independent methods, for any two, or the whole three, may be used in combination.

**(1) MASSAGE AND MOBILISATION.**—Massage owes its effectiveness largely to a reflex action. When a bone is broken the ends lacerate the surrounding tissues and cause painful stimuli to pass to the spinal cord. In response powerful efferent stimuli are sent to the muscles which pass into a condition of spasm which is the principal factor in producing and maintaining displacement of the site of fracture. By light rhythmical stroking movements applied to the skin over the site of injury countering influences are sent to diminution in displacement. Besides this action massage and early mobilisation of the limb both passively and actively have most beneficial effect is promoting the absorption of effusions from the tissues generally and from the joints and tendon sheaths specially. The nutrition of the limb is thereby promoted and the reparative process has-

tened. Muscular atrophy, painful neuritic symptoms, impairment of movements of joints and tendons are all avoided, and the limb is ready for full function immediately that union is sound. In many fractures of the upper limb excellent results are obtained by the use of this method and a simple arm sling. The type of fracture to which the method is most applicable is that where there is little original displacement, or where reduction is easy and redisplacement is unlikely, e.g., Colles' fracture. The disadvantage attending its use alone is the amount of personal attention and time which it requires. Of its immense value as an adjunct to other methods of treatment there can be no doubt.

**(2) SPLINTS AND EXTENSION.**—This must be the most general method of treatment. It is essential that as accurate as possible primary reduction of the fracture shall be secured, and for this powerful extension under deep anaesthesia is often required. As I have said before, the Thomas splint and its modifications have the widest field of usefulness. It facilitates the moving and the nursing of the patient, and by its means effective extension and counter-extension can be applied. Robert Jones considers that there are a few fractures which will not yield to a patient and skilful use of this method. Lateral and over-riding displacement can usually be readily overcome, but more difficulty is experienced with axial displacement, especially of short fragments, and to meet these difficulties new splints have been devised, with the object of bring these distal fragments into line with the proximal, i.e., frames for carrying the upper limb in a position of abduction or adduction and outward rotation in fractures of the upper end of the humerus; for the maintenance of supination in fractures near the proximal end of the radius, and for wide abduction of both lower limbs in fracture of the neck of the femur. Plaster of Paris cases are of great service for similar purposes. Extension is, of course, most commonly applied by means of adhesive strapping, but in certain cases other devices are useful. In a fracture of the leg bones where the condition of the skin precludes the use of strapping, the Sinclair foot piece, which is attached to the foot by a special glue, may be applied. In other cases, such, for example, as the supracondylar fracture of the femur, greater extension may be required for reduction than can be attained by means of strapping. Various forms of direct extension to the bone may be used. Stenimann's pins may be driven into the femoral condyles, or the condyles or the tuberosities of the tibia may be drilled, and

a metal rod put through, or an apparatus known as the ice tongs may be made to grip the femur. I have used Stenimann's method on several occasions in difficult cases with good results, weights of between twenty and thirty pounds being put on. The pins generally work loose in about three weeks, and in future I shall adopt the transfixion method in such cases. The disadvantage is the liability to a slight bone necrosis and persistence of a sinus for some time after removal of the pin. Hey Groves describes a double transfixion apparatus for use in fractures of long bones. The upper and lower rods are connected by a pair of vertical rods which can be elongated by means of a screw tube.

**(3) OPERATION.**—On the indications for operative interference there has been much debate. Important factors are the facilities for securing a perfect aseptic technique and the familiarity of the surgeon with this particular class of work. The main indication for operation is the failure to restore the bones to a correct anatomical position by extension methods applied for ten days. Operation should, I think, be the routine treatment in fractures of the patella and olecranon, and it is very often called for in the case of detachment of a process from the bone as in fracture of a condyle, trochanter of malleolus. There is a great variety in operative methods to select from:—(1) *Operative reduction and retention by external splinting.*—This is often all that is required in a spinal fracture of the tibia where the fragments can be made to dovetail. (2) *Suturing.*—This may be used especially in patella and olecranon fractures, wire being the commonest substance used. In fracture of the patella I pass a wire round the circumference of the bone and draw in the fragments. In some patella cases, catgut suture of the ligaments is sufficient to maintain position. Encircling wire may be used to hold together long oblique fractures, but it is apt to interfere with the blood supply, and so delay osteogenesis. (3) *Screwing and Pegging.*—Pegs or screws of metal, ivory, or bone, are used to fasten on detached pieces of bone such as malleolus or condyle. (4) *Plating.*—The use of metal plates such as internal splints is too well known to require discussion. The main objection raised to their use is that their presence has an inhibitory influence on callus formation. It has happened in my own practice on several occasions that no repair in a fracture tibia took place until the plate was removed, when it rapidly occurred. Rutherford Morrison figures a striking case in which callus formation in a plated femur was present only on the side of the bone distant from

the plate. Another objection raised against the presence of plates is their tendency to loosen from the bone, to cause irritation and a serous outpouring into the tissues with sinus formation, necessitating removal of the plate. I have recently seen a case in which, two years ago, I plated a mal-united fracture of the radius. The result was satisfactory until a month ago. The patient was carrying a heavy piece of furniture when she felt the bone snap. X-ray examination showed a transverse fracture through the lowest screw hole, the bone having been partially absorbed around the

screw. To overcome their objections fixation with plates made from boiled beef bone has been introduced. These are fixed in place with bone screws and both plate and screws become incorporated with the living one. This appears to be an ideal method. Gallie and Robertson report 100 successful cases so treated. (5) *Bone Grafting*.—The great exponent of this method in treatment of ordinary fractures is Albee. He deprecates the use of any non-absorbable foreign material. He favours the use of a sliding inlay graft cut with the twin saw of his motor outfit.