THE INITIAL TREATMENT OF A FRACTURED LIMB.¹

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When a medical man is called upon to attend a case of fracture of a limb, the occasion is generally that of an accident on the hunting field, a motor smash on a country high road, or possibly an ordinary casualty on the streets or in the factory of a city. In the latter two instances one is more conveniently placed, as the personnel and material for treatment are probably more ready to hand, whereas in the former urgencies this is generally not so. But, in all cases, the treatment should commence from the time that the injured person is first seen by the surgeon or first-aid worker, and should be continuous and consecutive until cure is effected.

The surgeon has to decide at once whether he will take charge of the case himself, and so must frame his rules of procedure in accordance with his own experience of success with manipulation or other applicable methods. Even with the help of modern fracture equipment and the X-ray screen, a large and varied experience of manipulative treatment of deformities does not necessarily ensure that this form of treatment will be unfailingly successful in producing perfect reposition; it is, therefore, necessary in a percentage of cases to have recourse to such expedients as mechanical pulls, and when these fail, then to attack the seat of fracture by direct operation, with plating, wiring, bolting, bone grafting, &c.

When this is indicated, the operation should be done within a short space of time after the injury, and then only when perfect asepsis can be obtained. In any case the surgeon’s immediate action is demanded, and the first essential is to steady the limb, and temporarily fix the broken bone or bones, so that no further movement of them is permitted; by so doing hemorrhage, further laceration of soft structures, pain and shock, will be diminished.

In the case of the upper extremity, bandaging the arm to the side may perhaps be sufficient, but in the case of the lower extremity some form of splint is required, and there are two splints which do efficiently meet the case in all fractures of both upper and lower limbs. These two splints were so well tested and proved in the Great War, that I cannot conceive any more critical trials to which an apparatus could be subjected.

FIRST-AID TREATMENT OF THE ARM.

Every fracture above the lower third of the forearm can be efficiently treated by the application of the “swivel-arm Thomas’s splint.”

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instrument differs from "Thomas’s knee splint" only in that the ring is round and made to swivel at the points of attachment to the side bars, instead of being oval and fixed obliquely to the bars. The application of the splint is so very simple. A temporary extension is taken by means of a double hitch of bandage placed over the well-padded wrist. The two ends of the bandage are tied to the end of the splint, with a pull sufficient to immobilize the fracture. The counter extension is taken from the anterior and posterior axillary folds when the arm is at the side, but from the side wall of the chest in the region of the armpit when the arm is abducted. This apparatus allows the arm to be brought in to the side of the body without increasing the extension, and so facilitates the transport of the case. A circular bandage is applied enclosing the arm and side bars from the hand up to the ring of the splint, in order to complete the immobilization of the fracture. The splint is equally suitable both in the initial and subsequent treatment of any fracture of the arm from the shoulder-joint downwards.

Just as the splint above described may be used for all fractures of the arm above the wrist, so, in the leg, the first-aid treatment of all fractures above the ankle-joint can be efficiently carried out by the application of the Thomas knee splint, which is by far the finest piece of apparatus in our fracture equipment. It is applied in the following way. Maintaining manual extension on the ankle all the time, the leg is threaded through the ring of the splint without removing the trousers. If there is a selection of splints with different-sized rings to hand, then the transverse circumferential measurement of the thigh over the trousers should be made at the gluteal fold. To this figure add 1 inch to allow for the obliquity of the ring, 1 inch for clothing, and 2 inches for possible subsequent swelling, and this should be the inside circumferential measurement of the padded ring. Thereby all accessory padding which would be necessary for an unduly large ring will be obviated. The ring is pushed up gradually and firmly against the tuber ischii and kept there by the operator, who holds the distal end of the splint against his own thigh, at the same time supporting the patient’s leg posteriorly at the site of fracture with his left hand and maintaining the extension on the ankle with his right hand, which is held underneath the inner side bar.

An assistant takes a six-inch roller bandage, ties the end to the outer side bar near the ring, and passes it behind the thigh from side to side, first over the inner bar and then back over the outer one, and so on until the whole of the posterior aspect of the limb is supported; the bandage is then tied to one or other of the side bars.

If the operator has a "boot clamp" (fig. 1), he fixes it obliquely like the skewer to the boot, as explained below (fig. 2); if not, he then takes a rigid metal rod or skewer, about twelve inches long and three-sixteenths inches in diameter, pointed at one end. This is passed obliquely through the boot between the sole of the foot and the sole of the boot. The hole on the
outer side should be about three inches from the front surface of the heel, and the inner hole one inch from this surface (fig. 3).

This allows the leg to lie in external rotation, which is the natural position of the leg in the recumbent position, and the one in which it ought to be ultimately splinted.

A cork or narrow roller bandage is placed over the pointed end of the skewer for safety, and a piece of tape or bandage attached to each extremity of the skewer. These are made taut, and tied to the V at the end of the splint with sufficient tension to maintain the requisite extension.

The patient is lifted on to a stretcher, and a "suspension bar" is applied, from which the side bars of the splint are slung. After a limb has once been splinted, the side bars of the Thomas should never be allowed to rest on the same plane as that on which the patient’s body and sound leg are lying. If this occurs, the side bars fall back and the limb is forced too far forward, thus increasing the deformity, causing pain, and so altering the correct relative position of the limb to the splint into a faulty one. An
alternative method of raising the splint is either to attach a "splint-prop" to the end of the splint, or to rest the end of the Thomas below the level of the sole of the boot on some form of support, such as rolled-up clothing, etc. If the fracture be simple, the clothing may or may not be cut off the leg at the site of fracture. If a wound be present, the skin round it should be sterilized by painting with three per cent picric acid in methylated spirit, any obvious dirt or other foreign body picked out, and the picric solution applied to the superficial surface of the wound, which is then covered with a sterile dressing, and finally a prophylactic dose of tetanus antitoxin given. A firm pad may be placed on either side of the knee between the limb and the side bars and the leg and splint bandaged at this level; this will give greater security, and will compensate for the extension through the foot not being a very great one. Cotton wool, or padding, should be placed in the space between the thigh and ring of the splint, so as to make an unduly large ring fit more accurately. Any such padding between the outer bar and the thigh will prevent the ring from slipping inwards and losing its purchase against the tuber ischii and so coming in contact with the middle line of the perineum. Padding between the anterior half of the ring and the anterior surface of the thigh will render it impossible for the leg to be lifted up into the forepart of the splint, thereby allowing the ring to slip up beyond the ischial tuberosity. This is an all-important point, for the tuberosity is the only place on which the counter-extension can be taken.

Too much extension must not be taken through the foot, and this extension must only be considered as temporarily applied for transport to hospital or nursing home, where permanent extension is substituted as soon as possible. If the temporary extension is too great or persisted in too long, pressure of the boot, especially in cold weather, will cause obstruction of the dorsalis pedis artery. This remark similarly applies to extension by means of a clove-hitch round the ankle or wrist.

The fracture having been extended and immobilized the patient is now ready for transport in ambulance or train. He should be kept warm to combat shock and pain until he arrives at hospital, and morphia may be administered with the same objects in view. On admission to hospital the patient is not necessarily removed from the stretcher at once. A varying degree of shock may contra-indicate removal and suggest rather rest and resuscitative measures for some hours. As soon as the patient is in a fit state, antero-posterior and lateral radiograms should be taken, or a stereoscopic pair may be substituted, if the injury is too high up for the lateral view to be obtained. The further procedure will be governed by the clinical findings and the interpretation of these radiograms. The possibility of a nerve lesion should always be considered. Injuries of the peripheral nerves are liable to be overlooked, as the symptoms are frequently overshadowed by the manifest pain at the site of fracture. It is preferable to make this diagnosis before a general anaesthetic is administered. Furthermore, a more accurate prognosis can be offered.
The Initial Treatment of a Fractured Limb

I need hardly say that routine investigation by means of X-ray examination is not only necessary, but essential, if the best results are to be obtained. Perchance it may not be available, and then the fracture is put up in the best position, as ascertainable by the eye, by measurements, etc. Extension is applied until reduction of deformity is judged to have taken place and a second pair of radiograms, if possible, is taken with the patient in bed without altering any details of splinting. This will afford a correct appreciation of the condition which is presented, and prove if the reduction or setting of the fragments has been accomplished.

If the position is satisfactory, the next pair of radiograms is taken when the fracture is beginning to mend, and this gives an insight to the progress of the case and if the correction is being maintained. And when callus is visible further attempts to obtain exact position (not already obtained) will no longer be possible unless open operation is undertaken. The necessity of this will, of course, depend on the amount of deformity presented, the loss of function that will follow if the displacement is not dealt with, and the delayed convalescence which will ensue. However, young callus can be bent, and may be likened to a candle in a candlestick on a hot day in summer. It will bend to almost any degree, and so will callus if it be subjected to a gradual and constant force. But, just like a candle, it will crack if too abrupt a strain be put upon it, such as a speedy attempt to correct deformity. Still the correction of alignment can often be obtained by a slow and regular stress.

Before allowing a patient to walk without the aid of apparatus, two radiograms should always be taken at right angles to one another. This is the most accurate way of estimating the amount of consolidation that is present in length, in breadth, and in thickness. It may even be possible in a recent fracture to obtain a radiogram in one plane, which will not show any bony lesion whatsoever; in this case, a grave error in diagnosis and prognosis will result from the taking of the picture in only one plane.

For the successful treatment of fractures it is more than ancillary, it is essential, that a mobile X-ray plant should be available, to be brought to photograph the patient's limb when he is lying in bed. The moving of a patient to an X-ray room is liable to interfere with the extension which is being maintained, and thereby may jeopardize the end-result of his treatment. If mobile X-ray plants were available for the use of any medical practitioner who required one, in my opinion great advantage would accrue both to the patient and the profession.

Every fracture presents four problems of paramount importance:—

(1) The correction of the deformity—or the so-called setting of the fracture. This should be done at the earliest possible moment after the injury has occurred.

(2) The maintenance of the corrected position until finality. This, in my opinion, is best accomplished by correct splinting, with efficient extension and suspension of the limb, thus assisting in the nursing and comfort of the patient.
(3) The preservation of the mobility of the joints, which applies particularly to the joint immediately below the fracture. This joint should be moved at the earliest opportunity, that is, as soon as there is sufficient young callus round the fracture to prevent a recurrence of displacement while the joint is being moved. The object is not only to move the joint, but to stretch and periodically move the young fibrous tissue between the contiguous injured muscles, and progressively to extend the deep scar-tissue, which has become attached to the callus. The subjacent joint may have its ultimate movements restricted, but this is often dependent on the extent of the damage to the muscles and tissues surrounding the fracture, and the limitation will be more marked if the fibrous tissue heals matted together to the callus and bone. Also a better prognosis with regard to movements can be given, provided the joint has escaped damage at the time of the accident, as the fracture is situated farther away from the joint.

(4) The gradual restoration of the lost functions of the limb. A great number of these will reappear if the alignment has been correctly restored, and their return will be hastened by the judicious employment of massage, electricity, differential bathing, etc.

A fracture, from the point of view of treatment, must be considered not only as a solution of continuity of bone, but also as a lesion possibly affecting muscles, vessels, joints, ligaments, nerves, etc. The ideal treatment of a fracture should have for its object complete anatomical reposition of the injured tissues with complete restoration of functional power to the affected part. Our aim, therefore, in the treatment of every fracture should be to produce a limb in the most expeditious way as nearly as possible the equal of its fellow, both in function and in appearance.