Some Remarks

ON

"BONE-SETTING": THE PRACTICE AND RESULTS OF FORCED MOVEMENT.

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THE whole subject of the treatment of the after-effects of injury is interwoven with that of the administration of forced movement, and this in turn is intimately connected with the art of what is commonly known as "bone-setting." The principles which underly the administration of forced movement in the massage-room are very similar to those that should control forced movement under an anæsthetic. I am constantly asked to expound the principles of "bone-setting," to explain as far as I may why the quack "bone-setter" is able to flourish so exceedingly, and to compare the results of "bone-setting" with those of orthodox practice. The first reflection is that the material on which the "bone-setter" thrives should never exist. This does not mean that the formation of adhesions can always be wholly prevented, but it should be, and may be, very greatly eliminated; and, whenever this is impossible, the adhesions should be broken down at the earliest possible moment. Speaking generally, it may be said that the "bone-setter" flourishes, not because people suffer injury, but on account of the treatment they receive. The doctrine of fixation, rest, and splintage is his great ally; his enemy is the treatment of recent injury by mobilisation. Until the time has come when the old teaching of absolute and prolonged rest after injury shall have been supplanted by Lucas-Championnière's doctrine of the scientific combination of rest with mobilisation, the type of disability which fills the "bone-setter's" rooms will never decrease.

But, do what we may, no amount of skill in treatment will always prevent the formation of adhesions after injury, especially in the presence of sepsis; and, if they form, it is essential that we should know how to deal with them, and carry out our treatment as early as possible.

It has fallen to me to encounter many of the failures of the "bone-setter," and from them much may be learnt. I have also had the most valuable and, I believe, uncommon experience of witnessing the results of mobilisation under anæsthesia as practised by a very large number of different surgeons—some, as I believe, too conservative, some too drastic. I have also discussed this subject very widely with surgeons on both sides of the Atlantic, and have been able to form conclusions as the result of these varied experiences. In my own practice I know only too well how often I have withheld my hand when movement under anæsthesia would have saved prolonged treatment, pain, and tedious convalescence. I know, too, why I have been so often tempted thus in the past, and the reason may be summed up in one word—failure. It was only when I realised the cause of failure that I again began to practise manipulation under anæsthesia and formulated the principles which I believe should govern the art. Now this method of treatment is a mainstay on which I frequently

rely not only to hasten convalescence, but very often to render possible cure of disability.

CAUSES OF FAILURE.

The cause of my failure in earlier days was dual in origin; first, I did not know what the natural movements of joints were, and second, I tended to do too much. Because a patient is unconscious he cannot feel pain, but this is no excuse for mobilising a joint indiscriminately. During conscious life reflex contraction of the muscles that oppose a movement invariably takes place so as to limit the movement before undue strain is placed upon normal structures. Under anæsthesia this protective reflex is lacking, and so it behoves us, if we would avoid inflicting injury, to exercise even more care when we approach the limit of movement than we should use were the patient conscious.

Then comes a consideration which I believe to be very generally overlooked, but clinical experience has convinced me of its accuracy. This is that adaptive shortening takes place in the body with astounding rapidity, and particularly in the presence of pathological change, even though this change is only reflex wasting of muscle. Each muscle fibre and group of fibres is surrounded by a connective-tissue sheath, and this sheath is endowed with the property of elasticity. Deprived of its function of shortening and lengthening, the sheath seems to lose its capacity very rapidly, and, for the time being, becomes comparatively inextensible. The whole muscle mass, in other words, has undergone adaptive shortening. Restoration of function alone restores the elasticity. If, then, we imagine that the movement, say, of extension of the elbow has been limited by adhesions in or round the joint for some weeks, it follows that the flexors throughout that time have never been fully stretched. The elasticity of the fibrous tissue which goes to the make-up of the anatomical muscular mass has, therefore, never been utilised to the full extent since the day when adhesions which limit extension first began to form. The result is that the elasticity remains unimpaired only through the range of movement allowed by the adhesions. Beyond this range the elasticity is impaired, or, if the lesion is of long standing, may be almost non-existent. When the patient has been anæsthetised and movement has been performed through sufficient amplitude to rupture the adhesions, all further attempt at movement will tend to place undue strain upon the fibrous tissue, which, as we have seen, has suffered impairment of its extensible properties owing to disuse. Forced movement through the full anatomical range may thus inflict severe injury on the fibrous tissue that has lost the elasticity which is essential for the natural performance of the movement.

RULES IN MANIPULATION.

The first golden rule in manipulation under anæsthesia should therefore be that no further attempt at movement is to be made in any direction when once a definite adhesion has been felt to give way. If this rule is ignored injury will inevitably be inflicted on the fibrous tissue which forms a large bulk of the muscles which oppose the movement. Movement in other directions may, however, be continued. Two criticisms then arise. First, full range of movement may not have been restored by one manipulation; and, second, we do not know that, because one adhesion has been broken, there may not be others which still limit movement.

The answer to the first criticism is this. Rupture of a pathological band is practically painless, and the local reaction is mild and transitory when compared with the considerable reaction that follows undue stretching—i.e., spraining—of physiological tissue. There should be, therefore, no interference with function and the voluntary use of the limb after skilled mobilisation, except that due to inelasticity of the fibrous tissue within the muscles, and perhaps a mental incapacity to realise that movement or use, which has hitherto been impossible, is restored. Functional use of the limb will rapidly restore the elasticity either up to the anatomical limit or up to the limit allowed by other adhesions, should these exist. If, on the other hand, we have forced movement to the anatomical limit, and have thereby overstretched the temporarily inelastic fibrous tissue, we have inflicted a more or less severe sprain, since normal movement may be excessive for structures that have undergone adaptive shortening. Thus we inflict a fresh injury which may be no less difficult to cure than that which the patient originally sustained.

The answer to the second criticism is that it is better to break down any second adhesion under a second anæsthetic and inflict no further injury, than to break down both at once and inflict an injury which is a potent predisposing agency to the formation of new adhesions. Essentially is the old adage "More haste, less speed" applicable to forced movement under anæsthesia.

The criterion of success after the manipulation should be that the patient has increased function; loss of function speaks of an error in technique. Unfortunately this is not generally realised, and many surgeons labour under the delusion that, should the necessity of giving a second anæsthetic arise, they made an error in not doing sufficient on the first occasion. The "bone-setter" suffers from no such delusion, and frequently arranges from the outset to perform a series of manipulations when proposing to loosen a joint in which there has been gross limitation of movement for a considerable time. His practice is sound, and we should undoubtedly accept this lesson he teaches. More active harm is done by excessive movement under anæsthesia than passive harm by neglect to use this most valuable remedial agency.

CHOICE OF TIME, ANÆSTHETIC, AND TECHNIQUE.

The question as to when forcible manipulation should be performed is not an easy one to answer. If the injury has been uncomplicated by sepsis, it is probably unwise to proceed until six weeks have elapsed since the receipt of injury. I have fixed this limit for the simple reason that it is by no means certain that the exercise of the voluntary function of the limb will not restore the movement that is lacking till at least this time has elapsed. If sepsis has been present, and if this has obviously played some part in causing the limitation of movement, it is probably unwise to manipulate the part forcibly for several months, three to six, according to the severity of the sepsis. The same applies to cases in which loss of function is due to osteoarthritis and similar causes. I make it a rule also to hold my hand for three months at least in all cases where injury has resulted in the outpouring of an excessive callus formation.

It is not uncommon for attempts to be made to break down adhesions without the aid of an anæsthetic. Provided the limitation of movement

is small, and the original injury to the joint in question is probably slight, this is quite justifiable. For instance, it is often a simple matter to rupture adhesions in the inferior radio-ulnar joint after a Colles's fracture without an anæsthetic. On the other hand, an attempt to flex rigid metacarpophalangeal joints in similar manner is opposed by the full strength of the long extensors in the forearm, and the movement cannot be performed without severely straining and thus injuring them. It should be a guiding rule, therefore, always to administer an anæsthetic whenever we are liable to encounter severe muscular resistance to our manipulations.

The choice of anæsthetic depends chiefly on the skill of the anæsthetist. Nitrous oxide gas suffices if adequate skill in administration is forthcoming, and if the manipulator knows exactly what to do and how to do it. Very few seconds should suffice for the manipulation of most joints, and a skilled anæsthetist can almost always ensure this much at least of complete relaxation with nitrous oxide gas. For manipulation of the hip or back it is wise to use some other anæsthetic, as more time is required for these manipulations than in most other joints.

The grip employed during manipulation is important. Our aim being to rupture an offending band *and no more*, it is usually wise to use as short a leverage as possible. Then, too, we want to reduce subsequent pain and disability to a minimum, and experience shows that this end is attained better if the adhesions are broken by a single sharp movement than by a slow gradual tearing. Rapidity of movement should be combined as far as is compatible with complete control, which checks the movement the moment the objective—i.e., the rupture of the adhesion—has been attained. On the other hand, nothing could possibly represent a greater error in technique than to give a succession of ineffective tugs on the offending band. Once its resistance is encountered it must be overcome forthwith; once overcome, the movement must instantly cease.

Hutton's statement that force in pulling or pushing is valueless, but that "the twist is the thing," gives the key to manipulations of most joints. The whole art is the knowledge of what precise "twist" to administer to each individual joint.

GENERAL PROCEDURE.

The first thing to ascertain definitely is what movement or movements are limited or give rise to pain, and it is usually wise to compare the mobility of the sound limb with that which we are about to manipulate. Then, directly the patient is relaxed under the anæsthetic, every movement which the patient can perform freely and voluntarily is carried out rapidly. If any resistance is encountered we know the patient is not relaxed, and await a more propitious moment for breaking the adhesions. Once relaxation is assured, the joint is moved firmly and steadily past the obstruction. If movement has not been limited, but only painful, full movement through the anatomical limits should be performed in all directions. If movement has been limited, only those movements which have previously been free and painless may be performed to the full. As we pass the limit set by adhesions, one of two things will be noticed: either there will be a sharp crack or click, or a dull tearing, often felt rather than heard. Instantly manipulation becomes more guarded, and is carried on only sufficiently to feel

that free movement is now possible past the point to which it was formerly limited. The manipulation then ceases in the direction chosen, and the process is repeated in any other direction in which movement had previously been limited. Nothing whatever is to be gained by repetition of movement in any direction, if those already performed have been carried through with necessary exactitude. To repeat a movement is a confession of doubt as to the skill with which our performance has been carried out.

The patient is allowed to come round and, as soon as possible, is called upon voluntarily to perform the movement which has hitherto been limited. If the movement is performed more freely or with less pain, the manipulation may be regarded as having been skilfully performed; if it is more limited or if pain persists for more than, say, half an hour to an extent that limits voluntary activity, then we must have grave doubts as to whether we have not been over-zealous. It is essential that properly devised exercises should be prescribed forthwith, and that these should be faithfully carried out. If any period of rest is necessary after the manipulation on account of pain, the whole success of the proceeding is jeopardised.

If the limitation of movement has been due to dense muscular adhesions, or to adhesions within tendon-sheaths, an alternative course is open to us. If we proceed as already indicated, very little progress will be made and frequent repetition will be essential. As it is usually unwise to repeat manipulation within a week, this means a prolonged and tedious recovery. It is well, then, to have an alternative method of treatment, and this is to be found in free manipulation followed by immediate fixation in plaster over *very* thick padding. The reaction is intense and pain acute, usually for several days, and nothing except morphia suffices as a rule to secure sleep. The plaster should be left untouched until the pain is definitely easing off, which usually means a delay of several days. Then it is cut sufficiently to allow the part to be massaged while still resting on the padding on the surface opposite to our manipulations. Pure relaxed movement is then performed, as for recent injury, in the direction opposite to that in which the limb has been fixed; the original posture is next restored, and the portion of the plaster removed for the manipulation is replaced in position and fixed there rigidly by adhesive plaster. The retentive apparatus is usually required for four weeks, after which it is discarded by slow stages.

THE MOVEMENT OF INDIVIDUAL JOINTS.

A few details regarding the essentials to be noted when moving individual joints call for special emphasis.

The Shoulder-joint.

When dealing with the shoulder it must be remembered that few people can, when recumbent, touch the side of their face with the surface of the arm by movement solely in the horizontal plane. The limit of normal movement in this direction depends on the position of rotation of the head of the bone, and the widest range of abduction is reached when the internal epicondyle faces directly forwards. Even so, full abduction is rarely possible without a small degree of flexion. Movement in the horizontal plane may be performed until the angle between the arm and the neck is some 30°; the limb then requires to be carried

forward before it is dropped back nearly into the former plane, resting against the side of the head. Neglect of this precaution only tends to strain normal structures, and should the surgeon imagine that the normal limitation of movement is pathological a very severe sprain will be inflicted. After abduction movement has been performed the elbow is flexed to a right angle and carried forward across the chest. External rotation is performed in this position, but natural movement ceases considerably before the forearm is vertical. Abduction is then performed, combining this with both external and internal rotation, and the elbow is carried round the base of a cone of which the head of the humerus forms the apex. Until the abduction is just short of a right angle the scapula should not have moved; if it has done so it is well that an assistant should check it by pressure on the axillary border. The movement proceeds until an offending band is felt to give or until the movement has been completed as already indicated. The patient is then rolled on to his side and internal rotation is carried out until the posterior aspect of the second finger rests vertically upon the spinous processes between the scapulæ. Movement in any given direction ceases the moment any definite obstruction has been overcome. Only one other detail calls for emphasis. It is well to guard the biceps tendon with the thumb as it rests in the bicipital groove throughout the manipulation.

The Elbow-joint.

When manipulating an elbow one special precaution is necessary which does not apply to the treatment of other joints. Here, too vigorous treatment is liable to meet with a disaster which is not likely to be encountered in other situations. If there has been a recent fracture in the neighbourhood, an excessive outpouring of callus is very liable to take place; while, if no fracture has previously been present, vigorous movement is liable so to damage the bone that a similar disaster is likely to follow. The greatest caution is needed when manipulating an elbow in a patient who has recently sustained a fracture through the olecranon fossa, fracture of the anterior part of the head of the radius, or a dislocation of the joint, even though X ray examination reveals no evidence of injury to bone. After fracture of the olecranon, a T-shaped fracture into the joint, or oblique separation of part of the head of the radius, less caution is called for. No special laws govern the performance of flexion, though the existence of the "carrying angle" must be kept in mind; but when extension is limited, two points of paramount importance must be regarded. First, every care must be taken to prevent the head of the radius from being pulled forward. This can be done by exerting backward pressure with the thumb over the head of the bone throughout the manipulation. Then, second, it is essential to note that the movement is performed with due respect to the "carrying angle." Unless this is done the lateral ligaments on the outer side of the joint are sure to suffer severe injury. Full extension should, of course, be secured in full supination. Far better is it to do too little when manipulating an elbow than to do too much.

Radio-ulnar and Wrist-joints.

Manipulation of the radio-ulnar joints requires attention to the fact that the movement at the lower joint differs from that at the upper in so far as it is not a pure rotation. As the lower end revolves from supination to pronation round the

head of the ulna, it simultaneously glides forward. It is always well, therefore, to free the antero-posterior movement which is possible at this joint before forcing rotation. This should then be performed with firm backward pressure over the lower end of the radius for supination, and with forward pressure during pronation. The hand on the front of the wrist in this case exerts its pressure over the region of the lower end of the ulna. Unless this antero-posterior movement is secured the posterior ligament of the inferior radio-ulnar joint is liable to suffer severe damage during forcible pronation, and the anterior ligament during supination. If the obstruction is at the upper end of the radius care must be taken lest we inflict injury which will excite callus formation.

The wrist is a difficult joint to deal with as there is so much, as a rule, that requires to be done. The amount of flexion and extension that are possible vary in each individual. It is essential, therefore, to examine the mobility of the sound wrist. Pure ulnar and radial deviation are well marked and often of wide range, but (and this point is often missed) there is a very considerable amount of true rotation possible independent of the radio-ulnar joints. Finally, there is not only the radio-carpal joint to consider, but, even more important very often, there are the joints between the inter-articular fibro-cartilage and the head of the ulna above and the carpus below. In full pronation these joints are, to all intents and purposes, locked; but in supination there should be very considerable antero-posterior mobility. The loosening of these joints is often all that is necessary in order to restore perfect function to a practically useless limb. Unless they are freed no amount of manipulation of the wrist will ever restore freedom of movement or function.

Joints of the Hand.

Manipulation of the hand is a somewhat lengthy process, but it should be possible to do all that is necessary under gas. Yet time is sure to press, and it is well to have a regular routine in mind so that nothing may be missed. The first carpo-metacarpal joint is freed by grasping the thumb and exerting full tension in the long axis of the metacarpal. The digit is then carried into full abduction posteriorly and is swung round into full opposition. Great care is necessary to avoid torsion at the metacarpophalangeal joint during the movement. The joints between the bases of the remaining metacarpals are next freed by exerting a posterior pressure on the head of one metacarpal and an anterior on the next adjacent, and then reversing the movement. Each pair is dealt with in turn. Having done this we ensure that our objective has been secured by forming the posterior convex arch which the heads of the metacarpals can assume and flattening it out again.

Digital Joints.

Manipulation of the digits is frequently mismanaged. It cannot be emphasised too often or too strongly that the metacarpophalangeal and interphalangeal joints are not pure hinge joints. A marked gliding element is present and, unless this is regarded, the posterior ligament and probably both lateral ligaments will be torn during forced flexion. Considering the metacarpophalangeal joint as a type, in full extension the base of the proximal phalanx rests upon the extreme distal extremity of the articular surface

of the metacarpal. If hyper-extension is possible it rests towards the posterior aspect. In full flexion, on the other hand, the situation of the base of the phalanx has shifted very considerably, and it now rests well down on the anterior surface of the bone. The nature of the manipulation required is now manifest. Little or no attempt is made to *bend* the joint. The digit is grasped firmly and longitudinal tension is applied. Abduction and adduction of the phalanx on the metacarpal are first given in each direction, then rotation is performed with the joint very slightly flexed. The lateralisation is given in full extension, but rotation is very limited in this position and only becomes free when a minute amount of flexion has been added. Then pressure is exerted anteriorly on the head of the metacarpal and posteriorly over the base of the phalanx. Instantly flexion begins. The direction of the pressure over the back of the base of the phalanx alters and tends to follow the base of the bone round the head of the metacarpal until it is exerted directly in the long axis of the metacarpal, when full flexion is reached. The movement should partake far more of the nature of movement of the head of the metacarpal on the phalanx than vice versa. The wrist, of course, should be kept in dorsi-flexion throughout. Extension is performed by reversing the process. In this way only can the ligaments be saved from tearing. At the proximal inter-phalangeal joints the tendons of the interossei are thus saved from damage—an accident which I have seen lead to almost irretrievable injury. Each joint in each digit is treated in similar manner. It is fatal to force full movement if rigidity has been serious or of long standing, or if it is in part the outcome of sepsis. In these cases movement should be performed in each direction just past the "dead point" and no more. Even though the amount of movement gained is minute, still it is enough; and it paves the way for greater gain at a subsequent manipulation. If too much is attempted the last condition of the patient is sure to be worse than before the manipulation. It is hard to avoid doing too much.

The Hip-joint.

The manipulation of the hip should always begin with rotation. This is performed with the limb lying in full extension on the couch. The knee and hip are then flexed simultaneously until the sole of the foot rests on the couch as near to the buttock as is possible, or as near as the foot has travelled after obstruction has been overcome. Abduction and adduction follow in this position. Then the limb is grasped and rotation is again performed in the flexed position, followed by circumduction as the joint is extended. The hip and the first carpo-metacarpal joint afford examples of joints which, when stiff as the result of old-standing osteo-arthritis, offer the most encouraging prognosis in treatment by manipulation. The course of the disease is not altered, but mobility is frequently increased and pain diminished. Needless to say, manipulation performed during the active stages of the disease leads to disaster.

The Knee-joint.

The most satisfactory position for the manipulation of the knee is with the patient recumbent in such a position that the end of the couch can be lowered from beneath the posterior aspect of the limb as far as the level of the junction of the middle and lower thirds of the thigh. The first essential step is to ensure that there is free lateral

mobility of the patella. If firmly fixed, a not very severe strain will sometimes suffice to cause a transverse fracture. Flexion is then performed either to the limit of movement or until an adhesion has been felt to yield. A firm grip is then taken by the disengaged hand on either side of the joint just above the two tuberosities of the tibia, and the leg is rotated alternately inwards and outwards as extension is once more restored. Still maintaining this grip to guard the semilunar cartilages, the last few degrees of complete extension are added with firm pressure, so as to ensure the full locking of the joint by the final rotation of the tibia on the femur. Great care should be taken to ensure that there is no sudden jarring when the full extension is reached, otherwise the internal semilunar cartilage is liable to be injured.

The Ankle-joint.

The ankle-joint presents no special features from the manipulative point of view, save only that we must remember that little force usually suffices to effect our object and that the external ligament is very easily sprained. The chief difficulty is that the manipulation is most easily performed if the knee is flexed. Hence the best position for the manipulation is with the leg dependent over the end of the couch, or, failing this, with the patient prone and the leg vertical—a position none too easy to secure under gas. It should be remembered that flexion and extension take place in an unexpected plane—namely, in a position of apparent slight eversion. Dorsi-flexion, moreover, should be performed by tension downwards on the heel, and not by pushing upwards of the metatarsal heads. If we rely on this lever for our force the joints in the anterior part of the foot are almost sure to be strained. There is only slight lateral mobility in the ankle-joint, and this is in acute plantar-flexion. The adhesions that follow a sprained ankle commonly do not yield to manipulation of the ankle only. If the tendon sheaths of any of the tendons that pass from the leg to the foot have been involved, it is usually necessary to add manipulation of the foot-joints simultaneously.

Joints of the Foot.

The joints of the foot when stiff from osteoarthritis afford a worse prognosis as the result of manipulation than any other. Indeed, increase of mobility may yield only increase of pain on walking. On the other hand, if the disability has followed trauma and the joints are free from disease, results are frequently secured only less "miraculous" than those that follow manipulation of a knee, in which mobility has been perfect and the disability limited to occasional pain or sensation of weakness. The ankle should, in the first place, be locked in dorsi-flexion, and the os calcis is then lateralised by a firm grip on the heel. The intertarsal joints are next dealt with by performing a kind of wringing movement of the fore part of the foot upon the hind part. It is not enough to secure eversion and inversion of the foot at the subastragaloid joint; definite rotation (almost pronation and supination) of the fore part of the foot is possible. The base of the first metatarsal is endowed naturally with considerable mobility on the internal cuneiform, and particularly in the directions of dorsi- and plantar-flexion, and attention to this joint will frequently transform a well-nigh helpless cripple into one who can walk freely without pain. The laws which govern manipulation of the joints of the hand all apply

with equal force to those of the foot. One small detail is perhaps worthy of notice. It is not uncommon for the "bone-setter" to claim that he cures flat-feet by manipulation. To this extent perhaps he is right—flat-foot in itself is not usually a disabling condition; it is only when mobility between the joints is impaired that pain and disability are present. Otherwise surely every ballet-dancer should be completely crippled! A "bone-setting" operation may therefore cure the pain of an early flat-foot case; it does not cure the condition. So, too, the claim is sometimes made that cases of metatarsalgia can be cured by manipulation. Again there is a germ of truth hidden beneath an unlikely statement. Sometimes it will happen that a patient with this trouble will trace its origin to a definite occasion on which he trod on a pebble, or walked over cobbles in thin shoes. His pain may be that of metatarsalgia; but, on examination, the anterior arch is not found to be "broken" unduly and there is no pain on pressure, only on movement. Then manipulation offers every prospect of cure, as the trouble has originated in a simple traumatic arthritis. Anæsthesia may not be required for the "cure."

Little need be added on the subject of breaking down adhesions that are due to trauma of muscles or of tendon sheaths. The chief thing to remember is that no harm is done by doing too little; severe injury is always inflicted if we do too much. Repetition of the manipulation is also frequently advisable.

TRAUMATIC LUMBAGO.

One word remains to be said concerning the so-called "traumatic lumbago." The victim is not a malingerer, though often he is dubbed as such. The disability is very severe; if the origin is due to adhesions following rupture of a few muscle fibres, the treatment fortunately is easy and usually satisfactory. The patient is given a general anæsthetic, and is placed fully recumbent. The hip of the less painful side is fully flexed into the abdomen and is again placed by its fellow. The process is repeated on the opposite side. Then both hips are flexed together on to the abdomen, flexion of the knee in each instance coinciding with the flexion of the hip. When the anterior surfaces of the two thighs are as far as possible in contact with the abdomen the sacrum is raised well away from the couch. The pelvis is then waved freely from side to side as the extreme flexion is slowly relaxed, and rotation of the spine is performed. When lateral movement is no longer possible without dragging the sacrum from side to side on the couch the patient is placed fully recumbent once more, and the hands are passed round the trunk till they meet in the mid-line behind. Then firm traction is exerted forwards as if attempting to raise the whole weight of the body. A considerable arching of the back is thus secured, and lateralisation is administered as the traction is relaxed and the recumbent position is slowly restored. "Traumatic lumbago" is frequently due to a slight tilting of one ilium on the sacrum. The pain can be relieved almost spontaneously by treating the patient prone. One hand is placed over the region of the posterior superior spine and exerts downward pressure, while the other forcibly pulls the thigh backwards.

The cervical region is sometimes affected in similar manner, or symptoms (neuralgic pains in the back of the head and neck, and even brachial

neuritis) may be described in the absence of a history of definite injury. There is no call for anæsthesia for the performance of the manipulations. The patient is placed recumbent, with the head and neck projecting freely over the end of the couch. The head rests upon the manipulator's hands, and the main point that calls for attention is that tension should be given by securing a firm grip either of occiput and mastoid on each side with one hand, or of occiput with one hand and chin with the other—a grip corresponding to that of the collar in ordinary head suspension—before the movements of flexion, extension, lateralisation, and rotation are performed.

At the other end of the spine we meet with that troublesome and often intractable complaint, coccydynia. Sometimes this can be relieved by manipulation, and sometimes it fails. The forefinger must be passed into the rectum, and each joint is then manipulated in turn. In addition to the pure flexion and extension a slight twisting movement should be added. Care must be taken not to be too severe in carrying out the manipulation.

There is no "mystery" in the art of "bone-setting." Certain details require attention and nothing more. We must know what the natural movement of the joint is, we must realise its limits, we must avoid laying any strain whatever on any normal structure—under anæsthesia there is no protective reflex to save it from harm—and all will be well. But under anæsthesia nothing is more simple than to damage normal structures, and then we have to face the unpleasant necessity of dealing with a sprain of our own creation. It is often an easy matter, when administering forced movement without an anæsthetic, to strain severely any muscle that is thrown into reflex protective spasm during the manipulation.

If our object is to relieve pain or secure increased mobility, we have failed if either of these two objects fall short of attainment. In mobilisation under anæsthesia we have very often an excellent example of the fact that in many cases we do not cure, but depend on the patient's voluntary coöperation before the end is achieved. Manipulation will often suffice to cure pain alone, but it is rarely enough to restore movement. After mobilisation the patient must be taught how to improve his mobility as the result of voluntary effort, and without skilled teaching and cordial coöperation the whole procedure may be rendered void and of no effect, for the adhesions will quickly re-form. It is for this reason that severe pain after manipulation should be regarded as an indication of failure. The pain inhibits voluntary action, and without this recovery is well-nigh hopeless. Unless the patient owns up to greater comfort or more freedom within an hour or so of the manipulation, too much has probably been done.

APPLICATION OF PRINCIPLES ENUNCIATED TO TREATMENT BY MASSAGE.

The application of the principles already laid down to manipulation in the massage-room is simple. In the first place, the anæsthesia of forcible manipulation has as its object relaxation of the antagonists that oppose the movement we wish to perform. In massage this place is taken by "active relaxation." As soon as pain is felt this relaxation is supplanted by reflex spasm of the antagonists, which can only be abolished by calling upon the muscles which control the movement to

contract. This, of necessity, causes reflex relaxation of the antagonists. In the massage-room, therefore, forced movement should always partake of the nature of assistive movement. Far better is it to assist the action of a muscle than attempt to stretch or tire out its antagonists. There should be no excuse for confounding forced movement with passive movement. The latter can only be administered when the patient's muscles are in a condition of complete voluntary relaxation, and when there is no perceptible obstacle to movement.

The laws which govern the direction in which manipulation is to be given are, of course, identical in the two cases. Only one word is necessary. When applying tension the greatest care should be taken not to let the grasp slip. The grip, in other words, must be very firm. The manipulation must be performed smoothly and with even pressure; there must be no aimless wagging to and fro and no spasmodic jerking. The pressure must be released as smoothly and gradually as it was applied.

In order that the patient may be in the most favourable attitude to contract his antagonists, the position in which he is placed in the massage-room as a preliminary to the administration of forced movement is not always identical with that chosen when the manipulation is to be performed under a general anæsthetic.

Thus, for instance, flexion of the knee is often best performed with the patient on his face, and the foot is often manipulated to best advantage while the leg rests on the masseur's lap. Shoulder and elbow are best treated absolutely recumbent.

AFTER-TREATMENT.

The after-treatment of cases that have been treated by mobilisation under an anæsthetic varies with the condition found. Restoration of function being the objective, active movement must be prescribed at the earliest possible moment. This should be within a few hours of the manipulation, and, if possible, within a few minutes. But all manipulations must be regarded in the light of the infliction of injury. If pathological tissue has been broken down—the picture is far different if it has been severely stretched only—the injury, as a rule, is trivial, and we can proceed apace. If pathological or normal structures have been stretched, reaction varies with the amount of damage done. It may only be very slight. On the other hand, if manipulation has been too vigorous, or if it has been unskillfully performed, then the structures around the joint—ligaments and tendons—and the muscles that control the movements of the joint have suffered injury, which may amount only to slight strain, to sprains of all degrees of severity, until finally we come to the by no means unknown catastrophes, torn muscles, tendons or ligaments, or even dislocation and fracture. Obviously treatment must vary with the extent of the damage done, and this can only be gauged by reaction. To expect a masseur to put a joint through its full range of movement merely because this has been done under anæsthesia is utterly preposterous, unless, indeed, we have the certainty that no strain has been placed on any non-pathological tissue. So rarely, however, is this the case that the full range of movement is rarely attainable for two or three days unless there was little or no previous limitation. Each case must be treated individually, and the laws which govern all treatment of recent injury must be respected.