ON THE MANIPULATION OF JOINTS.

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In a previous article (Journal of the Royal Army Medical Corps, February, 1938), the indications for the use of manipulative surgery were discussed. The treatment of dislocations is dealt with in standard surgical textbooks and is not being considered in this article.

In manipulating a joint the object to be attained is the restoration of function. Treatment does not end with the freeing of the joint but necessarily includes after-treatment such as massage and remedial exercises. The gaining of the patient's confidence in the restoration of neuromuscular control is essential.

Some of the great bone-setters of the past have stated as regards their technique that "the twist is the thing." This can be interpreted to mean that the particular manoeuvre is carried out suddenly and catches the controlling muscles off their guard. A sudden movement is more likely to rupture an adhesion, but at times stretching by a series of movements is the best that can be attained. The latter is necessary where there is the possibility of infection so as to guard against reaction.

Range of movement in individual joints will be discussed more fully when considering them regionally as well as special notes as to grip.

Generally speaking, for the spine and lower limb the patient should be recumbent; for the arm or foot where anaesthesia is not used, he may either lie or sit. The operator's stance or seat will be on the affected side or at the foot of the couch to allow of the easiest control of the affected part. Ambidexterity is necessary for satisfactory manipulation. A suitable couch or operating table of strong construction and sufficiently padded is required; a stool is also of use for the operator to stand on for some manipulations.

The Spinal Column.—In dealing with the cervical region the patient should be on his back with the shoulders well up to the end of the couch. The patient's head is gripped by a hand on each side; thumbs forward and fingers towards the nape of the neck.

In addition to purely spinal movements there is very free flexion and extension of the occiput on the atlas.

There are two types of movement in the cervical spine: (a) Where the head is carried in the horizontal plane; (b) a much freer action where the head moves with the spine in extension and flexion. A similar range of movement occurs also in the lumbar spine.

In the cervical spine flexion should bring the chin to the upper end of
the sternum, a movement familiar in testing for meningitis. Extension is to about 45°. Side flexion is attainable to about 65° and rotation about 75°.

The dorsal spine is much less mobile than the cervical. In the upper part movements are chiefly flexion and extension, whereas in the lower part they tend to merge into that of the lumbar region.

In considering the dorsal region, the costo-vertebral joints must not be forgotten, and in the whole spinal area lesions of the muscles play an important part.

Rotation is obtainable in either the sitting or the prone position. For the former the patient sits on a stool of suitable height and the operator standing behind, grips a shoulder with each hand and forcibly rotates the body, a manœuvre involving chiefly the lumbar region.

Extension can be obtained by supporting the lower dorsal region with one hand whilst the other presses the upper chest back. Where the lumbar region is also involved, if the feet are supported by the operator or a heavy piece of furniture, extension is obtained by allowing the head to fall back towards the floor. Flexion is obtainable by the reverse movements. Lateral flexion can be obtained passively by passing one arm under the axilla of the patient from behind and round in front to the waist when the patient can be lifted or forced to one side.

In the lateral position on the couch rotation is obtained by pulling the shoulder back and pressing the pelvis in the opposite direction with the other hand.

Flexion can be obtained by passing one arm behind the thigh and lifting them up towards the chin. The operator will require a stool to stand on and when the patient is heavy, additional force is obtainable by grasping both hands.

Extension is obtained with the patient in the prone position when the thighs are lifted up off the couch.

For a much fuller consideration of the problems of backache, the best textbook is Mennell’s “Backache,” where the subject is gone into much more fully than can be done in this article.

The Upper Limb.—The clavicular joints seldom require manipulation apart from dislocations.

The shoulder joint more often develops adhesions outside rather than inside the joint as a result of trauma or disease. The movements are:

Flexion: A forward movement through an angle of 90° at the joint itself. A further 90° is obtained by movement of the scapula.

Extension is a backward movement through 45°, the latter part of which is aided by the scapula moving.

Abduction is the raising of the arm away from the body and has a range of 90°. The arm can be raised through another 90° to the vertical by moving the scapula.

Rotation occurs between the humerus and glenoid cavity in the long axis of the humerus through a range of 90°.
Circumduction is a combination of these various movements.

In so far as the scapula is movable over the chest wall, this mobility has constantly to be borne in mind in relation to the scapulo-humeral joint. Either or both sets of movements may be limited, and when manipulation is done on the shoulder joint proper, fixation of the scapula is necessary.

For moving the shoulder joint either a long or a short grip may be used.

In the long grip, the forearm is grasped just below the elbow which is flexed to a right angle, the shoulder blade being fixed by the operator’s other hand or an assistant, the various movements at the joint are gone through.

In the short grip, with the patient lying down, the operator’s hand grasps the arm about halfway up with the elbow resting on his forearm. This grip gives a better hold as regards abduction.

The Elbow-joint.—This is a composite joint including a Ling action of the ulna on the humerus through a range of 135° and a rotatory movement of the radius on the ulna of 180° at their upper joint.

For flexion, the lower arm is gripped by one hand whilst the other grasps the wrist and forces the hand towards the shoulder.

For obtaining extension one hand is passed round the inner side of the arm to grasp the lower end of the humerus from behind. The other hand then presses the front of the supinated forearm above the wrist into the extended position. This latter manœuvre can be assisted between treatments by the patient carrying a weight.

In dealing with the radio-ulnar joints the elbow is grasped by one hand whilst the radius is rotated by a handshake grip.

“Pulled elbow” in children is a subluxation of the upper radio-ulnar joint. It can be reduced by using the last-named grip, rotation of the radius being combined with a thrust of the radius towards the humerus with the elbow flexed to a right angle. In an early case this can be done easily without pain or anaesthesia.

Tennis elbow may be due to one of several underlying pathological causes such as an inflamed bursa under the extensors of the wrist or adhesions resulting from ruptured muscle fibres. Manipulation will consist of rotation of the radius with the wrist in the flexed position with accompanying pressure of the thumb over the tender spot; varying degrees of extension or flexion of the elbow may be necessary in different cases. Careful after-treatment by massage and movements is necessary.

The Wrist-joint and Hand.—The normal movements are flexion through 90°, extension 65°, adduction 60°, abduction 45°. In addition there is circumduction. Movement of the lower end of the radius on the ulna exists in a range of 180° in pronation and supination. There is a certain amount of mobility in the carpus and metacarpo-carpal joints in addition to those which take place mainly at the carpo-radial joint.

The wrist, like the shoulder and ankle, is very liable to stiffness resulting from peritendinous adhesions resulting from Colles’ fracture and traumatic
or septic tenosynovitis. Fracture of the scaphoid has also to be considered. The freeing of these adhesions may require faradization to free them in their line of pull.

In manipulating, the hand is grasped in the hand-shake position whilst the lower end of the forearm is steadied by the other. The wrist is then put through its various movements.

Where the tendons are bound down, manipulation will free them in the direction of their relaxation. Taking the flexors first the fingers are extended and the whole hand is bent back on the forearm. For the extensors the fingers are doubled up and the wrist is forcibly flexed.

The metacarpo-phalangeal and second interphalangeal joints flex to a right angle, whilst the first has an additional 45° of flexion. The first-mentioned has also adduction and abduction through a small range and circumduction.

In the thumb metacarpo-phalangeal and interphalangeal joints have flexion only of 90°. The metacarpo-carpal joint has as movements adduction, abduction, extension, and opposition. The metacarpo-phalangeal joint is liable to subluxation as a result of injury to the lateral ligaments, a condition known as boxer’s thumb (British Medical Journal, 1930). This requires efficient reduction and splinting in the correct position as early as possible if permanent disability is to be avoided.

In manipulating the digits, traction in the long axis is a desirable preliminary. In dealing with these joints as with others, efficient control of the proximal bone is essential, particularly if the bones have lost their density.

It should always be borne in mind that much stiffness of the hand occurs secondarily to fractures about the wrist and to sepsis; efficient treatment of these conditions should therefore reduce the number of cases requiring manipulation to restore function.

The Hip-joint.—This is a ball-and-socket joint of strong construction. Its movements consist of flexion 150°, extension 45°, adduction and abduction each of 45°. Circumduction is a combination of these. External rotation is possible through about 60°, internally through 30°.

In manipulating the joint the patient lies on his back, and when under anaesthesia the pelvis requires fixation by an assistant or strap. Alternatively the sound thigh may be held up in extreme flexion or down on the couch, when the contrary manipulation is being performed on the affected side.

A long or short grip may be used comparable to that described for the shoulder, the latter being used mainly for abduction.

For rotatory movements the hip and knee are partially flexed, and one hand grips the knee whilst the other produces the rotation by a hold at the ankle.

The Knee-joint.—Extension in this joint consists of the tibia and femur being in line, flexion takes place until an angle of 45° occurs between these bones, movements are limited at their extremes by the crucial ligaments.
There is also rotation of the tibia on the femur which is associated with the "screw-home" in extension. In addition, when the joint is partially flexed a movement of the tibia at right angles to the long axis of the femur is obtained. The patella can also be moved laterally in addition to the usual voluntary one in extension and flexion, a point to be remembered in manipulative measures as its lateral movements may have to be freed first.

In manipulating, either short or long leverage may be employed. In short leverage the leg is grasped about its centre and the knee is forcibly flexed.

Long leverage is the more generally useful. One hand grasps the foot, palm of the hand under the heel, thumb on the outer side, fingers over the inner malleolus. The other hand supports the knee. With this grip all the movements necessary can be obtained including a slight degree of lateral mobility. Pressure from the controlling hand can be exerted where required, as over thickened synovial membrane or infra-patellar pads.

For obtaining the antero-posterior movements of the tibia on the femur, the hip and knee are flexed and the foot rests on the couch. The latter is steadied by the operator's buttock in the semi-sitting position on the couch and the hands grasp the tibia below the knee.

Manipulation is used in dealing with semilunar cartilage, and in many early cases reduction can be effected. As the cartilage, at best, is long in healing, subsequent operative removal is the more certain permanent cure. The manœuvre consists in the rotation of the tibia with the knee flexed to a right angle, abduction being maintained at the same time. This is followed by a quick extension accompanied by internal rotation. Where reduction is complete an audible snap is often heard and the patient should be able to extend the knee freely without pain. The after-treatment consists of early movement and massage, the avoidance of rotation which is aided by raising the inner border of the sole and heel, and elastic pressure.

Fuller details of internal derangements of this joint are well dealt with by Timbrell Fisher.

The Ankle and Foot.—There are roughly three zones of movement in this region, the ankle-joint proper (astragalo-tibial), mid-tarsal, and toes.

The ankle-joint has only dorsi- and plantar flexion through a range of about 90°.

At the mid-tarsal joint occur inversion, eversion rotation, and a certain degree of plantiflexion which is brought about by the short flexors of the foot and produces an approximation of the metatarsal heads and os calcis. Associated with these there is mobility of the metatarso-tarsal joints most marked in the 1st and 5th. Inversion and rotation bring the sole of the foot to look almost mesially, and is seen best in small children where it is under voluntary control. In adults wearing footgear much of this mobility is lost with secondary wasting of the short muscles, particularly in women wearing high heels.

The toes are similar in their movements to the fingers, but the range in
boot-wearing individuals is less than in those not using footgear and is not so free.

Tendinous adhesions have already been referred to.

As regards what is called by many "flat foot" and by orthopaedists more frequently as foot strain, there is a relative dropping of the antero-posterior arch associated with pain after use and decreased mobility. On mobilizing the region, adhesions in the flexor brevis origin area are found. If these are broken down and exercises instituted to the tibialis posticus and short flexors the condition should be cured. The insides of the soles should also be wedged up to take the strain off the calf muscles.

In manipulating the region one hand grasps the heel whilst the other holds the fore-foot and puts the foot through its various movements.

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