

Old unreduced dislocations : read at the Fifty-fifth Annual Session of the American Medical Association, in the Section on Surgery and Anatomy, and approved for publication by the Executive Committee: Drs. DeForest Willard, Charles A. Powers and J.E. Moore / DeForest Willard.

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OLD UNREDUCED DISLOCATIONS.

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PHILADELPHIA.

The term, old unreduced dislocations, is here used to cover cases where the joint surfaces remain luxated for a month or more after the accident. The delay in effecting reduction may have been due either to non-recognition of the condition or to the failure of the original manipulative replacement efforts. The designation "irreducible" is a misnomer, since a joint incapable of reduction by one method may be reducible by another procedure.

DIAGNOSIS.

The chief element in the prevention of this condition lies in immediate diagnosis at a time when reduction is easy; old dislocations exist because of faulty diagnosis. With ordinary anatomic and surgical knowledge, with anesthesia and the Röntgen ray, primary diagnosis is usually a simple matter. Whenever uncertainty exists in regard to an injury near a joint, anesthesia should be the rule, since without its employment the pain and swelling often render accurate diagnosis impossible. Diagnosis once established, the treatment follows as a natural sequence. If manipulative efforts fail, operative measures should be at once instituted. The greatest difficulty will, of course, be encountered in dislocations associated with neighboring fractures, especially in the shoulder region, while the cases most likely to be overlooked are those complicated by severe injuries of other portions of the body.



In old dislocations of the shoulder, the body should be stripped to the waist and examined sitting and standing. In fracture of the head of the humerus, or of the neck of the scapula, or a separation of an epiphysis, the elbow can be brought easily to the side of the body, and mobility is the rule instead of fixation. In all old hip luxations the patient should be naked and examined in both the recumbent and standing posture. By this method many errors will be avoided. By comparison with its fellow, the loss of normal movements, difference in contour, altered relation of bones and restricted motion will be noted.

Pathologic dislocations from hip disease, congenital dislocations, coxa vara, and sliding up of the trochanter after fracture of the neck, should be carefully differentiated. Not infrequently I have been obliged in consultation to restrain attempts at reduction in cases both of hip disease and of neck fracture, which had been incorrectly diagnosed as luxations.

COMPLICATIONS.

Complications and obstacles preventing reduction are: Inflammatory adhesions and deposits causing partial narrowing of the hole in the capsule; lacerations of muscles and tendons; filling up of the socket by torn muscle or fibrous deposit; fracture of the rim, with bony projections; fragments of fractured bone; a portion of capsule pushed back into the socket, and lastly, the anatomic and surgical ignorance of the surgeon. In dislocations of either shoulder or hip, fractures of the rim are not at all uncommon; the fragments may be found in the socket, or more frequently in the neighborhood, giving rise to osteophytes, which interfere most seriously with reduction, even after open incision. Such an osteophyte was the cause of a fatal result in the hands of Dr. Allis and myself, in which instance the external iliac vein was torn over a sharp cockspur bony point during manipulation of an old hip dislocation.

ACCIDENTS DURING MANIPULATIONS.

I shall never forget the suddenness with which a patient suddenly collapsed while I was assisting the late Professor Agnew, more than thirty years ago. In the midst of manipulations for reduction of a shoulder dislocation of six weeks' standing, a sudden ballooning of all the tissues about the axilla occurred, the patient became pulseless and apparently died; respiration ceased and the radial pulse disappeared. Instantaneous thumb pressure on the right subclavian artery arrested the current through an apparently ruptured axillary artery, and by the prompt application of restoratives the patient survived. The enormous hematoma that formed was afterward believed to have been produced by the tearing of the axillary vein. When the pulse returned at the wrist the tumor did not pulsate.

In Agnew's case only manipulations were employed, but in former days, when pulley traction was much more commonly used than at the present time, it was not remarkable that these accidents were common. Guérin tore off an entire arm. Bell tore the axillary structures to such an extent that immediate amputation was necessary. In other cases, gangrene has occurred, followed by either death or amputation. Gibson in 1823, in accordance with the practice of that day, after a week's depletion of blood letting, tartar emetic., etc., subjected the man to pulley extension and counter extension for half an hour, then manipulations were practiced for one and three-quarters of an hour more, one of the procedures being to hang the patient by the axilla over a door. As this was in preanesthetic days, and as the surgeon was obliged on the following morning to tie the subclavian for a pulsating tumor in the axilla, it is rather strange that the patient lived until the eighth day, with the arm in a state of incipient gangrene. The artery was found to have been firmly attached to the head of the bone and capsule.

Lister in 1873, in an old forward dislocation, ruptured the axillary artery with pulley traction by tearing a fibrous band attached to the coracoid and humerus. He tied the artery through an axillary incision and resected the head, but the patient died on the following day.

In twenty-four cases of injury to the axillary vessels during reduction manipulations collected by me,¹ fifteen terminated fatally; the result in two cases was uncertain; the axillary nerves were lacerated in one case; in another the brachial plexus was torn from the spinal column. Michans tore off both the median nerve and the brachial artery in reducing a luxation of the elbow, but saved the case by amputation. In the reduction of a posterior dislocation of the head of the femur, the sciatic nerve has been hooked up and carried forward in front of the neck of the femur, with great resultant tension and pain, flexion of the hip and disability.

OPERATIVE METHODS.

1. Manipulation and traction. 2. Continuous extension and counter-extension. 3. Arthrotomy, with section of all tissues interfering with reduction. 4. Resection, with replacement, when possible. 5. Subcutaneous incision of capsule or of surrounding tissues, a procedure usually uncertain and dangerous.

Manipulation and Traction.—In former times the resistance of the muscles was considered to be the chief element in the prevention of reduction, consequently extreme force by pulleys was employed, even to the tearing away of the limb. At the present time, recognizing that the muscles are only one of many obstacles involved, intelligent manipulation is considered of the first importance. An extreme degree of force should be avoided lest serious injury result. Full anesthesia should be secured and moderate manipulative and traction efforts instituted. These will vary with each joint involved, in accordance with the usual methods pursued in primary

1. Phila. Med. Times, Aug. 16, 1873.

cases, being varied to suit the position of the bone, the present condition as shown by palpation, the skiagraph, etc. Hand movements are, as a rule, much safer than instrumental.

Shoulder.—The manipulative efforts at the shoulder for the reduction of an old dislocation will vary but little from the ordinary ones employed in recent reductions save that great caution must be observed in the preliminary breaking up of adhesions. Serious accidents, as already enumerated, or fractures may readily be produced by undue force. The indications are: to fix the scapula, apply traction, adduction, external rotation, pressure on head, adduction, flexion, internal rotation.

The old method of upward traction was a most dangerous one, as it put great tension on the axillary tissues; outward traction is less risky, but should be employed with caution.

Reduction efforts rarely succeed four months after the luxation.

Hip.—An old hip-joint dislocation is a most formidable condition to encounter, and, next to the shoulder, this joint is the one most liable to be involved; it is also an injury most frequently undiagnosed, as the condition of fracture or of dislocation is often masked or overlooked when anesthesia has been carelessly omitted at the time of the original injury.

I recall a case that occurred twenty-five years ago, in which the man, three months after a heavy fall of earth compressing his body, was discovered to have a dorsal dislocation of the left hip. Under ether, I readily reduced this and placed it in the acetabulum with a distinct thud, and with the immediate resumption of the normal position of the leg. When comparison, however, was made with the right leg, it was discovered that the leg which had just been reduced was shorter than the one of the opposite side. This condition was very puzzling, until it was seen that the right leg was not only longer, but was also slightly everted, and that there was

a fullness in the region of the thyroid foramen, thus showing that there had been a forward simultaneous dislocation of the opposite hip, both legs having evidently been forced in the same direction. All efforts to reduce this failed, although, with the assistance of Dr. Allis, I applied all the then known methods of manipulation, leverage, traction, etc. The head could be carried to the position of dorsal dislocation, but could never be placed in the acetabulum. The fact that the left acetabulum had not been filled up through the three months, and that the rent in the capsule had not united, proved that other complications existed which prevented reduction of the right hip. What these complications were, of course, we could not determine, as at that time neither Allis nor myself was bold enough to cut down on the joint. Ten years later the man was doing hard laboring work.

Allis,² who has given most thorough experimental and practical work to hip dislocations, says that the greatest injury to the capsule is confined to the lower two-thirds, and that the upper thickened portion of the capsule, known as the Y ligament, is rarely lacerated, which accounts for its great service in restoration. The strong upper rim of the acetabulum, the surrounding muscles and the dense capsule, are all important elements in the prevention of a luxation.

A careful consideration, therefore, is necessary as to the probable character and direction of the force; whether a sudden blow or a slowly crushing power has been exerted. The *x*-ray is here most useful in determining the extent of the fractures and bony complications.

Allis' fundamental law is that a dislocated joint should be restored through steps in the reverse order of the displacement, consequently his manipulative reduction is based on the knowledge that the lower portion of the capsule is the one torn and that the head of the bone

² Dislocations of the Hip. Gross Prize Essay, Phil., 1896. Octavo, p. 167.

in dorsal dislocation, therefore, needs to be elevated into place. He first fastens the pelvis firmly to the floor by inserting into the wooden flooring three hooks—strong opened screw eyes—one near the perineum, and one on either side opposite the crest of the ilium. To these hooks the pelvis is firmly bandaged over towel pads. To avoid interference in the groins from the bandage, a flat metal cross, with its four ends curved on themselves sufficiently to hold the strips of the bandage, is placed above the pubis. To-and-fro turns of the bandage are then made from these hooks to the screw hooks in the floor. The femoral head is drawn downward by traction; then the flexed knee is lifted over the flexed arm of the surgeon until the head of the femur is brought opposite the acetabulum; if it catches on the rim, the surgeon steps across the opposite limb, carrying the knee with him into extreme adduction, while traction is still made toward the ceiling, and an assistant's hand is employed to lift the head into the socket. Reduction is usually accomplished with an audible snap. If it does not occur, the knee is then carried across the body to a state of abduction, while steady, simultaneous upward traction is employed. To increase the surgeon's tractile power, perforated iron bars are securely fixed with wet bandages to the sides of the lower half of the thigh. A rod connecting these bars makes an excellent handle for the surgeon in his traction and manipulation efforts. Fix pelvis, flex thigh, turn leg and heel out; lift, press on head, turn leg in, extend.

Second, or indirect method, employing the Y ligament of Bigelow as a fulcrum. When the head has been lifted as already described to a position just below the acetabulum, carry the knee with the leg flexed directly downward in extension; the Y ligament will thus be made tense and the head will be lifted into the socket. Bigelow's manipulations are flexion, abduction, eversion.

For a thyroid dislocation the reverse manipulations

may be practiced, still following the law of reversed order, or the head may be thrown into the dorsal position and then reduced. In the forward dislocation first flex, abduct and make traction outward; then an assistant presses on the head during adduction and traction. Forward dislocation, second method, utilizing the Y ligament, flex, abduct, carrying the knee obliquely inward and downward; then rotate outward; not circumduction, lest the sciatic nerve be hooked up.

Bigelow's manipulations for thyroid dislocation are flexion, adduction, inversion, lifting, circumduction.

Continuous Extension and Counter-extension.—After failure of reduction by manipulation, a very useful adjuvant, especially for the lower extremities, is the application of continued weight and pulley extension in bed for a week or more, so as to relax and quiet muscular action. At the end of this time, under thorough relaxation by ether, manipulative efforts may be successful, although failure has occurred at the first attempt.

In the upper extremity it is much more difficult to apply continuous extension satisfactorily, even with air pads in the axilla and Stimson's couch with its perforation for the arm.

Arthrotomy and Excision.—When manipulations fail, the question of open operation becomes a serious matter, especially at the hips. The tissues surrounding the joint have not only been originally injured, but have also been subjected to repeated traumatisms during the several efforts at reduction. Their resistive power to infection has consequently been greatly lowered, and septic influences easily prevail, as is well instanced in the following case:

A man, 28 years of age, with an eight-month-old dorsal dislocation of the hip that had resisted eight attempts at reduction by as many different surgeons, applied to me for relief. The hip was immovable and useless. A carefully planned and systematic effort at reduction was made by myself, assisted by Dr. Allis, but without avail. At the earnest solicitation of the man I consented to operate. An incision was made over the

trochanter, head and neck in the line of the gluteal muscles, separating the fibers; the tissues were cut away and the capsule opened, but the acetabulum could not be reached. An anterior incision was then made in the triangle formed by the tensor vaginæ femoris and the sartorius. The head of the sartorius and the long head of the rectus were cut away; the psoas was also cut from the lesser trochanter, the capsule opened, strong traction applied; the acetabulum was found filled to the level with fibrous tissue almost as tough as tendon. This was cut away with gouge and spud, and a large quantity of thickened tissue was cleaned from the head, which was even then reduced with great difficulty. The cushion in the acetabulum still prevented the head from sinking more than one-half into the cavity; the bone was, therefore, redislocated and the acetabulum absolutely cleared; at last the head remained easily in its socket; thorough drainage with rubber and gauze was introduced and the limb fixed with plaster of paris, slightly abducted and everted, and nearly in line with the body. The hemorrhage was considerable, but no ligatures were required after clamp hemostasis. The man vomited persistently from the time of operation, and died a week later from septic endocarditis. The operation was long and severe; the chances for infection were numerous.

Dr. Thomson fractured the femur in an attempt to reduce an old dislocation of the hip. He very wisely opened the joint, reduced the dislocation and the fracture, and retained the latter in position with a silver nail, thereby securing a good result.

Shoulder: The necessity for operative relief will depend largely on the amount of disability and the extent of the pain, the latter being caused by pressure on the nerves and vessels.

In a two-month-old subcoracoid dislocation of the shoulder, after failure of manipulative methods, and finding the head thoroughly fixed, I made an incision in the pectorodeltoid groove and resected a portion of the capsule and of the spinati muscles. As the luxation still refused to yield a second incision was made about the middle of the deltoid, separating the fibers, and after thoroughly dividing the tissues the head was at last successfully placed in the glenoid cavity. The capsule was so greatly injured that its remnants were stitched with catgut to the acromion; the arm was fastened

across the chest with a plaster-of-paris bandage, and, after two weeks, gentle passive movements were instituted, with good recovery of motion but with slight loss of abduction and elevation.

In a shoulder joint that was dislocated fifteen years previously through a football injury, and where the head of the bone slid back and forth on the anterior ledge of the glenoid, with some eighteen subsequent luxations inflammatory swellings and great disability, I made one incision in front of the deltoid and another through the center of the muscle, separating its fibers. The outer portion of the capsule had evidently been torn away at the time of the original injury, and the inner portion had been subsequently elongated and stretched. After replacing the bone the external portion of the capsule was stitched to the acromion and the anterior capsule folded and fastened with a chromicized catgut. The arm was held for several weeks in front of the thorax until good union had been secured, after which forward movements were especially encouraged, and a firm joint secured.³

The best access may be obtained to this region and the least injury done by cutting just posterior to the cephalic vein, in the groove between the deltoid and the pectoral; this gives excellent access to the head. The axillary incision, while more dangerous, is sometimes necessary when the adhesions between the head of the bone, arteries, veins and nerves are dense, and is also an excellent incision for resection, although through it the glenoid is less easily reached. If incision is made over the middle of the deltoid the fibers should be separated as much as possible, not divided, so as to avoid loss of abduction and elevation. The posterior incision, which starts beneath the acromion, is most liable to injure the circumflex nerve (which runs just below the acromial ridge), thus cut-

3. Burrell's operation for this condition of habitual dislocation is an excellent one. *Trans. Amer. Surg. Asso.*, vol. xv, p. 293.

ting off a large portion of the innervation of the deltoid. It affords easy access to the glenoid, but not to the head. Even with the anterior incision there will be some atrophy of the internal fibers of the deltoid, but this loss is partially compensated by the pectoral. The old operation of cutting off the attachment of the deltoid is a bad one. If the biceps tendon is torn or cut, it should be restitched. In excisions it is better to take away too much rather than too little. Hemorrhage is greatly lessened by closely hugging the bone with bone gouge or chisel. It is sometimes necessary to divide the tendons of the infraspinatus and supraspinatus, the long head of the biceps, subscapularis and teres minor. After freeing the tissues about the head and neck of femur or humerus, I have sometimes had the greatest difficulty in replacement and have been obliged to divide all the tissues most freely. In some cases traction on the head may be made through the incision by placing a curved bone elevator or strong wire about the head, by using a lever, or by drilling the bone and inserting strong steel hooks. When the glenoid cavity is filled with a tough cicatricial fibrous mass, the socket must be cleared with gouge and knife. In the young, great care should be taken not to injure the epiphysis, and resection should not be employed except under special circumstances. The natural accommodative mobility of the scapula must be taken into account, and the amount of adhesions. The subsequent fixation and pain depend largely on the original injury and the position of the head. In resections the keyhole saw or the heavy chain saw is advisable. Owing to the liability of breakage, I have had a chain saw made from an old *écraseur*. When old dislocation and fracture coexist, the question of manipulation or arthrotomy or excision is a serious one. The broken fragment may have united to the bone in bad position, or it may have become thoroughly adherent to surrounding tissues, or it may be entirely disconnected. Fragments may be nailed or wired in position. Re-

section of the head of humerus or femur, though often necessary in these cases, should not be undertaken as a positive rule, since a completely reduced upper joint fragment can sometimes be treated the same as an ordinary fracture and a fairly useful joint secured. In cases of doubt, an excision may be deferred in old persons until the amount of pain and disability is definitely ascertained, yet a resected shoulder joint, provided the muscles are not too seriously injured, often gives a more useful arm than the stiff ankylosed one so often secured by the forcible reduction of an old injury. Pressure of broken fragments on the axillary vessels and nerves usually gives great pain and demands resection. In one of my cases, however, where both dislocation and fracture existed, the aged man was so far advanced with locomotor ataxia that he was practically helpless, and lived several years without any serious inconvenience from the presence of the head in the axilla. In other cases, however, the pain is extreme; in others, the inflammatory adhesions fasten the tissues in a mass which will not only resist attempts at manipulative reduction, but even persist in spite of open incision. Fractures of the shaft of the humerus and of the femur are not uncommon during efforts at reduction.

It is extremely important that every aseptic precaution be taken, as disturbance of tissues already below the normal resistive point is prone to give septic results. Drainage either by rubber tube or gauze is necessary on account of the severity and length of the operation.

Arthroplasty.—I have tried a number of methods to prevent the union of joint surfaces, but nature, while sometimes tolerating a foreign substance, usually rebels against its continued presence. Gold or silver foil is less irritating than rubber tissue. The best method is, when possible, to turn in a flap of fascia or connective tissue.

Results.—Souchon⁴ gives, in his admirable compila-

4. Operation of Irreducible Dislocation of the Shoulder Joint, Trans. Amer. Surg. Asso., 1897; octavo, p. 138.

tion, the histories of 133 operative cases of old shoulder dislocation, with their results, accompanied by a complete bibliography. He gives the deaths immediately following the operation as 13 per cent., with an additional 10 per cent. subsequently; the chief causes being gangrene, hemorrhage, sepsis and pneumonia. Of the collected cases about 27 per cent. suppurated. Naturally, sepsis was much more frequent previous to 1885. A good result, however, has, according to statistics, been secured in over 50 per cent. of cases.

Reerink gives the fatality of shoulder excision: in 47 operative cases, 14 became infected and 8 died of sepsis and other causes.

Elbow: A dislocation of the elbow sometimes remains undiagnosed and becomes fixed in its malposition. In a case of four months' standing (Fig. 1) after the first failure at reduction I applied extension for a week. The woman was pregnant at the time, and the method gave so much pain and annoyance that after the second unsuccessful attempt at reduction I resected the condyles of the humerus through two lateral incisions (in preference to the posterior triceps cut), brought the ulna into position and secured a useful movable joint. A letter received last week states that the fetus was carried to full term, and that the elbow movements are nearly perfect, although strength is impaired.

Head of the Radius: An old dislocation of this joint is often difficult to replace, but extension, strong pressure and rotation will sometimes accomplish it. If unsuccessful, the joint should be opened, replaced and stitched or resected.

Clavicle: In an old dislocation of the outer end of the clavicle, Hopkins was able to hold it firmly in place by carrying an X-shaped suture of silkworm through two drill holes in each bone; silver wire would answer the same purpose, or a firm nail could be used.

Jaw: In a three-month-old dislocation of the jaw Mixer applied lever extension with the fulcrum oppo-

site the molars, and after forty-five minutes was able to reduce the dislocation.

Thumb: In old dislocations of the phalanges, where the head of the bone has passed between the tendons, these dense structures often resist all efforts at replacement and open incision is imperative.

AFTER-TREATMENT.

Passive movement should be instituted very early after reduction, and after operation in all old luxations.

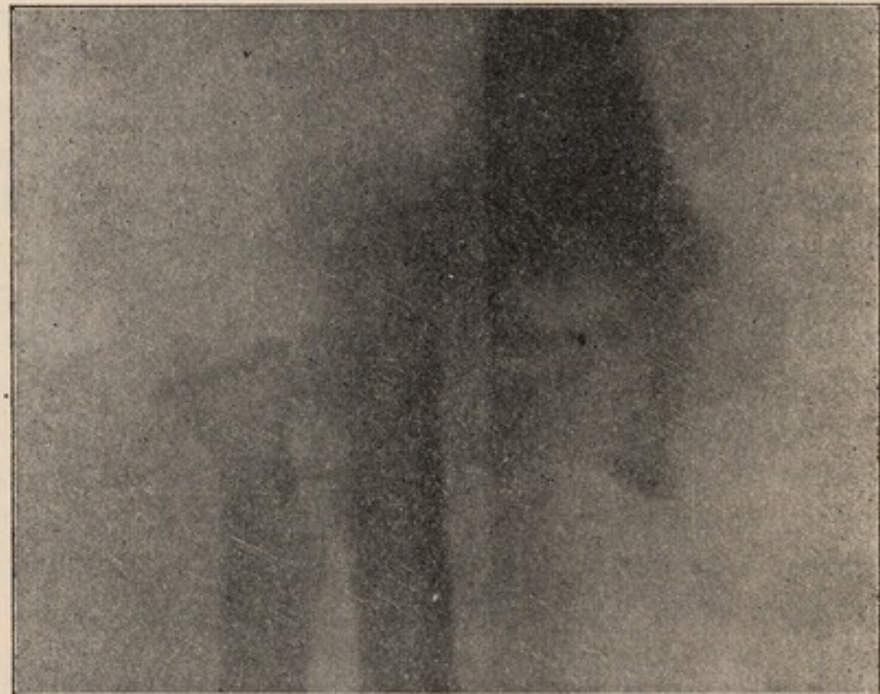


Fig. 1.—Lateral dislocation of elbow, four months' duration.

Electricity, massage, voluntary and involuntary muscular movements, gymnastics and other measures for the restoration of function must be continued for a long time.

CONCLUSIONS.

1. Early immediate diagnosis is the most important element in preventing the existence of old unreduced dislocation. With ether, the x -ray and anatomic and surgical knowledge, a recent displacement ought always

to be discovered by the surgeon. Immediate reduction by manipulation or open operation should follow.

2. An old, unrecognized dislocation should be carefully examined under the *x*-ray and ether to discover the extent of adhesions and the possibility of effecting reduction without extreme measures. The manipulations to be practiced are practically the same as those employed in recent luxations, but greater caution is necessary. Failing in these, continuous extension in bed should be practiced for a week; the second attempt, without the application of extreme force, should then be made, the permission of the patient having been previously obtained to permit of open operation, if deemed necessary.

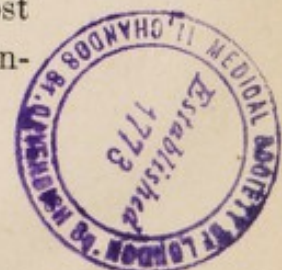
3. Open section should include the division of all muscular, tendinous, capsular and bony obstacles to reduction. When the socket is filled up with dense fibrous tissue, such tissue should be excavated, and the head of the bone placed *in situ*.

4. Partial or complete excision of the head and of fragments in case of fracture will frequently be necessitated.

5. In cases that have existed more than a year, or where the original injury has been extreme, operation should be avoided unless pressure on nerves or blood vessels is seriously impairing the usefulness of the limb or giving pain, but resection should be practiced in bad late cases, with pain and serious nerve symptoms.

6. Sepsis is frequent on account of the severity and length of the operation, and especially by reason of the non-resistive ability of the tissues due to the original injury and to repeated traumatism from manipulative efforts.

7. Pain, disability, age and occupation are the most important conditions in arriving at a decision concern-



ing operation. When a limb is useful in its new position, gives no pain or difficulty, it should be let alone.

8. In the after-treatment, muscular gymnastics, electricity, voluntary and involuntary muscular movements and massage are very important measures and should be persistently employed. These manipulations require both patience and pluck on the part of the patient.

