THE TREATMENT OF RECENT DISLOCATIONS AND FRACTURE-DISLOCATIONS OF THE SHOULDER

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Recent interest in dislocation of the shoulder has been largely devoted to treatment of the recurrent type of lesion. The acute dislocation has been taken for granted, and treatment by the manipulation which Kocher described in 1870 is still recommended as the method of choice. While it represented a distinct advance in its time, the method should now be discarded as dangerous and unphysiological.

Although Cubbins and his associates insist that the biceps tendon offers the chief obstruction to reduction of the dislocated shoulder, the resistance has generally been attributed to the tonic contraction of the subscapularis muscle. Stretching of this muscle with consequent release of the humeral head is the primary objective of Kocher's manoeuvre. Theoretically, it would seem to offer a satisfactory, although brutal, solution to the problem; but the danger lies in the fact that fracture of the shaft of the humerus may be the inadvertent sequel. Almost invariably the fracture line is oblique, running from below the lesser tuberosity upward and outward toward the tip of the greater tuberosity. The humeral head and lesser tuberosity constitute the smaller fragment; the shaft and the greater tuberosity constitute the larger fragment. The constancy of this effect must be attributed to the stress exerted by external rotation of the whole arm against the internal rotatory action of the subscapularis, acting upon the lesser tuberosity. Where the magnitude of this force exceeds the strength of the bone, fracture takes place.

In order to avoid this danger, the writer suggested a method which appears to be almost identical with the method attributed to Sir Robert Jones for the treatment of fracture-dislocations of the shoulder; but, where Jones was concerned primarily with aligning the humeral shaft with the axis of the dislocated head, this method has a deeper justification in the anatomical arrangement of the shoulder-girdle musculature. It is the only method in which the antagonism of individual muscles can be overcome, and in which the force used to overcome muscle pull is in the same direction as that needed to effect reduction.

In the so-called "anatomical position", with the humerus at the side, the direction of the various muscles around the shoulder girdle seems to be completely haphazard (Fig. 1). Some run upward and outward, others run downward and outward, while still others run either directly upward or downward. The resultant of the shoulder-girdle muscles, acting synergistically, is directed principally in a medial direction. With the arm in the anatomical position, this resultant exerts its maximum effect at a large angle, transverse to the longitudinal axis of the bone. The force which must be employed to conquer the resistance of the subscapularis must, at the same time, be large enough to overcome the medially acting components of the other muscles. When the tensile strength of the bone is inadequate to meet this stress, fracture results.

When the arm is placed in the overhead or fully abducted position, an entirely different situation is created. From wherever they arise, whether from in front or in back, all the shoulder muscles run directly upward to be inserted into the humerus or into the axis of the extended upper extremity. In a general manner, all these muscles can be roughly divided into three or four groups. Each of these may be considered as lying upon the surface of separate cones, the apices of which all lie upon a straight line. This straight line is collinear with the axis of the arm and its extension, the forearm (Fig. 2).

The innermost and shortest of these cones is formed by the subscapularis, the supraspinatus, the infraspinatus, and the teres minor. Together, their insertions into the head
of the humerus form the musculotendinous cuff, described by Codman. The second of these
groups comprises the latissimus dorsi, the teres major, and the pectoralis major. The apex
of this larger and more superficially situated conical group is placed more distally upon
the shaft of the humerus. The third group consists of the deltoid and the coracobrachialis.
The fourth and longest group is made up of the biceps and the triceps brachii, which insert
into the radius and ulna, respectively.

Of all the positions which the humerus may assume, the overhead position is the only
one in which all these muscles run in the same general direction. The resultant of the
shoulder muscles is coaxial with the humerus, and the transverse or fracturing component

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\text{is reduced to zero. Phylogenetically, this is significant, because the overhead attitude is}
\text{the position of arboreal brachiation. This is the position in which the resultant of the}
\text{total muscular effort acts to oppose the downward force of gravity, which tends to tear}
\text{the trunk away from the limb-clutching arms. It is the only position in which a single}
\text{force, exerted along the axis of the humerus, is accurately directed to overcome each and}
\text{all of the muscle actions at the same time. For this reason, it has been chosen as the}
\text{position in which reduction of dislocation of the shoulder should be undertaken, in preference}
\text{to the anatomical position employed by Kocher.}
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The manoeuvres employed have been previously described as follows: 9

"The patient lies in the supine position, while the surgeon takes his position on the
side of the dislocation. In a right sided dislocation the surgeon places his right hand upon
the patient’s right shoulder, so that the fingers find firm support on the top of the shoulder,
while the thumb is braced against the dislocated humeral head. . . . The right hand fixes
the head as the left hand gently abducts the arm into the overhead position. . . . During
this manoeuvre the head of the humerus is supported so that it cannot move from its
dislocated position. As a consequence, instead of moving downward as the arm moves
upward, the head rotates in place. In this manner the tendency to further stretch already
stressed nerves is obviated. . . . Once the arm has been brought into complete abduction
in this overhead position, all cross-stresses exerted by all the muscles have been elmi-

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**Fig. 1**
Drawing of arm in the "anatomical position" with the course of the perihumeral muscles inked in black. Note angle which adducted humerus makes with axillary border of scapula.

**Fig. 2**
Fig. 2: The same arm in complete overhead abduction. The scapula has rotated on the chest. The humerus is collinear with the axillary border of the scapula. All the perihumeral muscles fall into four groups of cones, the apices of which all lie in the axis of the humerus.
nated; the head can be gently pushed over the rim of the glenoid and the dislocation reduced..." (Fig. 3).

The application of the method to acute dislocation, whether associated with fracture or not, is illustrated in the following cases:

CASE 1. E. K., housewife, aged seventy-seven, was first seen April 25, 1940. Four days before, she had fallen and suffered "a subcoracoid dislocation of the shoulder, associated with a fracture of the greater tuberosity of the humerus". An unsuccessful effort had been made to reduce the dislocation.

On April 25, the patient was admitted to the hospital for a reduction under general anesthesia. Just before this was started, a final attempt to reduce the dislocation was made. The patient's arm was slowly brought into the completely overhead position. On several occasions, when the patient became fearful, progress was stopped, and the patient was soothed and cajoled into indolent cooperation. Once the arm had been brought into complete abduction, the head was gently pushed into the glenoid fossa. All clinical signs indicated complete reduction, and this was confirmed by the roentgenogram. A Velpeau bandage was applied for several days. On April 27, the patient was discharged with her arm in a sling. Motion was restricted for a matter of several weeks, but thereafter the patient gradually resumed her usual activities without any disability.

CASE 2. M. K., housewife, aged sixty-four, was seen on September 21, 1942. Early that morning, she had fallen and suffered a subcoracoid dislocation. A local physician had unsuccessfully attempted to reduce this dislocation under general anesthesia. Some hours later the patient was brought to New York.

The appearance of the arm was typical, and there was no evidence of nerve injury. The roentgenogram disclosed a subcoracoid dislocation of the proximal end of the humerus, associated with a comminuted fracture of the greater tuberosity of this bone. There was outward displacement of the free fragments.

Because of the previous failure of attempted reduction under general anesthesia, it was believed that great difficulty would be met in reducing this dislocation. Nevertheless, it was determined to make one effort by use of the method under discussion. No anesthesia was employed. The head of the humerus was fixed, while the arm was elevated with the greatest gentleness. When the arm had reached the overhead position, reduction was accomplished immediately, and even without the necessity of pushing the head over the glenoidal labrum. The patient experienced prompt relief of pain, with immediate restoration of the range of motion. She was given a sling and was permitted to be up and about, but was cautioned against excessive abduction of the arm. A roentgenogram taken on the following day was reported as showing "correction of pre-existing luxation of the humerus", with excellent alignment of the fragments at the site of the comminuted fracture of the greater tuberosity. Three days later, on September 26, it was noted that the patient was actively moving the arm. There was no evidence of brachial fixation or nerve injury. On the following day, the patient was discharged to her home in Connecticut.

The following case is of special interest because of the length of time which had elapsed before closed reduction by manipulation was successful. Many careful surgeons

Fig. 3
Steps in the reduction of dislocation of the right shoulder by the overhead abduction-traaction-pulsion method. (Reproduced from Surgery, 3: 739, 1938.)
believe that after the lapse of three to four weeks, manipulative reduction, presumably by the Kocher method, is fraught with unusual danger of fracture. After four to six weeks have passed, an unreduced dislocation of the shoulder was considered by Campbell to present a positive indication for open operation in practically all cases. This was not found to be necessary in the following instance:

**CASE 3.** J. R., housewife, aged seventy-six, was first seen on November 18, 1945. She gave a history of a fall on her outstretched right arm on October 22, 1945. She was taken to a hospital in Florida, where an attempt at reduction was made under general anaesthesia. Despite this, the patient continued to complain of pain so severe that she had to be given hypodermic medication. At the end of two weeks she was discharged to the care of her family physician, but he referred her back to the hospital. The patient was then given an intravenous anaesthesia, and another attempt at reduction was made. This, too, appears to have been unsuccessful, and roentgenograms taken on November 14, 1945, still showed a "subcoracoid dislocation" (Fig. 4-A). The patient thereupon came to New York.

During her trip north, the patient contracted a cold; and upon her admission to the hospital she presented signs of inflammation at the bases of both lungs posteriorly. Because of the presence of the pulmonary signs, the medical consultant advised against surgical procedures. Therefore, it was not until November 28 that the patient could be given a general anaesthetic.
DISLOCATIONS AND FRACTURE-DISLOCATIONS OF THE SHOULDER

To avoid the possibility of fracture or damage to the neurovascular structures, the arm was abducted with great care. No serious difficulty was experienced in getting the arm into the overhead position, but even strong pressure against the head did not effect reduction. At this point the shoulder was braced and, while gentle traction was exerted upon the abducted arm, firm pressure was maintained against the head of the humerus. Almost as soon as the combined traction and pulsion was applied, the head of the humerus slipped over the glenoidal rim and the arm could be brought to the side in a normal manner.

A postreduction roentgenogram (Fig. 4-B) was reported as showing almost complete correction of pre-existing subcoracoid dislocation of the humerus. In the soft tissues external to the proximal extremity of the humerus, there was an ossifying process. The patient made an uneventful recovery and was discharged from the hospital on December 9, 1945, with a fairly satisfactory range of motion. Under physical therapy, mobility was gradually increased, so that by the time she returned to her home in Florida, she had an almost normal range of motion.

In August 1946, the patient again fell upon her right shoulder. Because of the pain and limitation of abduction, she feared a recurrence of the dislocation and immediately came to New York; but a roentgenogram disclosed a fracture of the greater tuberosity without any displacement. The upper end of the humerus occupied its normal position in the glenoid fossa, and the calcification previously noted had entirely disappeared. The patient was treated by means of a sling, and made a completely uneventful recovery with normal range of motion.

Because of the extremely gentle manipulation employed, the possibility of danger either to nerves or blood vessels is minimal, and injury to them has not been encountered. In all probability, the nerve injuries which are attributed to the method of reduction are coincident with the dislocation. These occur in about one of every seven cases of so-called simple dislocation. In view of the legal implications which may be involved, no dislocation of the shoulder should be reduced until a preliminary and careful investigation for nerve involvement has been made.

Not even an apparently simple dislocation of the shoulder should be treated without roentgenographic examination. Contrary to the opinion of some authorities, fracture of the greater tuberosity occurs in over 10 per cent. of all the cases. While this is not usually of great significance, such a fracture fragment may be interposed between the glenoid fossa and the humeral head and so defeat the most skillful and conscientious efforts at reduction. Visualization of a fractured glenoid rim may forewarn the surgeon against too optimistic a prognosis. Above all, the roentgenogram is of value in the diagnosis of fracture-dislocation. In the presence of extensive hemorrhage, particularly if the patient is seen after the lapse of several days, the clinical diagnosis of fracture-dislocation may present the utmost difficulty.

Because of the impossibility of controlling the small capital fragment, the Kocher manipulation is not only foredoomed to failure, but may be fraught with consequences of a more serious nature. It is in such instances that methods other than the classical have been successfully instituted. This is illustrated in the following cases:

Case 4. R. M., aged twenty-seven, was admitted to the hospital October 30, 1937, shortly after he had fallen down a flight of stairs, landing on the outstretched left hand, with the elbow held in extension. He complained of severe pain in the left shoulder, radiating down to the posterior aspect of the elbow. In addition, he noted a sensation of numbness in the left hand.

The patient presented the typical clinical appearance of a subcoracoid dislocation of the left shoulder. There was a well-defined ulnar-nerve lesion with definite signs of motor weakness.

The roentgenogram (Fig. 5-A) revealed an oblique fracture of the upper end of the humeral shaft with subcoracoid dislocation of the capital fragment.

Under local anesthesia and by the method described here, reduction was accomplished without difficulty. The patient's arm was immobilized in a Velpeau bandage. A postreduction roentgenogram (Fig. 5-B) disclosed reduction of the dislocation with excellent reposition of the fractured fragments. Within a week after the reduction, return of some sensation in the ulnar-nerve distribution was noted; after about two weeks, sensation was almost normal, except for some dysaesthesia. This ultimately disappeared, with complete restoration of motion in the shoulder and return of motor power in the muscles supplied by the ulnar nerve.

Case 5. J. M., aged forty-six, was first seen on January 2, 1947, several days after he had fallen and injured his right shoulder. On the following day, a roentgenogram revealed a fracture-dislocation of the right shoulder.

Examination disclosed the characteristic clinical picture of subacromial dislocation. The roentgenograms...
revealed a comminuted fracture of the surgical neck of the humerus with a subcoracoid dislocation of mild degree (Fig. 6-A).

Because of the fracture, the possibility of using the Kocher manoeuvre for reduction of the dislocation could not be considered, and it was determined to attempt reduction by the method of overhead traction-pulsion. Under gas, oxygen, and ether anaesthesia, the arm was gently brought into the complete overhead position. The dislocation was promptly reduced with hardly any force, and the arm was brought to the side (Fig. 6-B). A hanging plaster-of-Paris cast was then applied to the arm and forearm. As soon as the patient had recovered from the anaesthesia, he was permitted to be up and about. He was discharged from the hospital on January 5, 1947.

The hanging plaster was left on for a little over five weeks, after which time physical therapy and active motions were begun. Function was gradually restored, so that by the end of April the patient was able to return to his usual duties as a police officer.

Case 6. R. K., aged sixty-four, was seen on July 7, 1947, shortly after she had slipped and fallen on her leg.

Fig. 6-A: Case 5, J. M. Comminuted fracture of the surgical neck with subcoracoid dislocation on the right side.
Fig. 6-B: Immediately after reduction.

Fig. 7-A: Case 6, R. K. Fracture-dislocation of left shoulder before reduction.
Fig. 7-B: After reduction.
outstretched left arm. The patient presented the typical appearance of a dislocation of the shoulder. There were no signs of any nerve involvement. The roentgenogram (Fig. 7-A) disclosed a subcoracoid dislocation of the head, with a longitudinal fracture of the greater tuberosity and a transverse fracture of the surgical neck of the humerus.

Because of the patient's extreme nervousness, the use of gas-oxygen anaesthesia was deemed necessary. As soon as primary analgesia had been obtained, the arm was gently manipulated into the overhead position and reduction was accomplished with almost no force (Fig. 7-B). The arm was immobilized in a Velpeau bandage, but slight active flexion and extension were begun within a few days. At the end of three weeks, active graded exercises were instituted.

In the treatment of simple dislocations, early motion is encouraged. Immobilization by means of a restrictive bandage is purposely avoided. The patient is provided with a sling and is urged to use the arm in all directions, except in abduction and in external rotation. By applying a "figure-of-eight" adhesive strap around the affected arm and the trunk, a "check" ligament is created, and the degree of abduction can be readily controlled (Fig. 8). As healing of the torn structure progresses, a greater degree of abduction may be permitted by gradually increasing the length of this "check" ligament. In this manner, function can be instituted from the very beginning, and the limiting effect of periarthritis can be minimized. Where the dislocation is complicated by a fracture, the beginning of motion must be deferred until consolidation has taken place. This may be accomplished by a Velpeau bandage, a hanging plaster, an abduction splint, or by traction in the recumbent position, as the exigencies of the case indicate.

CONCLUSIONS

During the past ten years, many types of shoulder dislocations, both with and without fracture, have been studied. In all, the treatment here described has been employed. The method has been found easy in its application and gratifying in its results. In no instance could any bone, vascular, or nerve lesion, be attributed to its use. It is founded upon a proper regard for the anatomy of the part; and, in consequence, requires exhibition of only a minimum of "brute force" to achieve satisfactory reduction. In most instances, it can be carried out without the necessity of narcosis. This holds true even for old and infirm patients, provided their confidence has been obtained and is not abused. Because of this, it may be used as an office or Out-Patient Department procedure.

(In an editorial on "Recurrent Dislocation of the Shoulder" in the British Volume of The Journal of Bone and Joint Surgery [30-B: 6-8, Feb. 1948], particular stress has been laid upon the necessity of preventing external rotation by immobilizing the shoulder in internal rotation for a period of at least four weeks. This seems to be in conformity with a very rational concept of shoulder dislocations, and should be employed in the post-reduction phase of the treatment.)

REFERENCES


VOL. 31-A. NO. 1. JANUARY 1949
DISCUSSION

TRAUMATIC DISLOCATION OF THE HUMERUS

(Continued from page 172)

DR. JOHN J. FAHEY, CHICAGO, ILLINOIS: We are indebted to Dr. Nicola and to Dr. Wilson and Dr. McKeever for these important contributions to the subject of shoulder dislocations. As previously reported by Dr. Nicola, Dr. DiCosola and I found that the most constant lesion of experimental dislocation seen at autopsy is a tearing of the capsule from the humeral neck, a portion of the subscapularis tendon sometimes being included. We were not able to produce an impacting force, while the extremity was in abduction and external rotation, which we thought was responsible for the shearing of the labrum from the glenoid. Abduction and external rotation will produce tears of the labrum from the glenoid or capsular tears from the labrum in approximately 25 per cent. of shoulders dislocated at autopsy. This same manoeuvre will frequently tear the capsule from the humeral neck on one side and will result in some type of lesion of the labrum on the opposite shoulder.

It is not easy to state that the mechanism causing labrum tears in young athletes is different from that in older individuals. Younger individuals quickly resume activity, and Dr. Nicola's apparatus for preventing abduction and external rotation seems promising in reducing the incidence of recurrence.

Immobilization for a period of eight weeks in older patients may result in some type of shoulder disability which outweighs the chance of recurrence.

Dr. Wilson and Dr. McKeever have focused our attention on a very rare type of shoulder lesion. Lack of experience with this dislocation does not permit me to discuss this paper thoroughly. If we follow these suggestions for early recognition of the cases, our information on this type of dislocation, which has been so clearly demonstrated, should rapidly increase.

DR. GEORGE E. BENNETT, BALTIMORE, MARYLAND: I have observed two cases of recurrent posterior dislocation of the shoulder in which reduction could be easily accomplished, but in which the head of the bone would immediately become redislocated posteriorly. In both cases, it was found at exploration that the biceps tendon had been partially torn from its sheath and was acting as a bowstring, preventing the shoulder from remaining in position.

DR. TOUFICK NICOLA (closing): Perhaps the eight-week period that I mentioned would be changed in older patients. There is no question in my mind that, if the shoulders in young patients are not immobilized, 100 per cent. recurrence will follow the acute dislocation, as happened in our series.

The dressing used after reduction allows flexion and extension of the elbow, pronation, supination, and full use of the hand; and yet it does not allow too much atrophy, as would happen if you put it close to the chest.

DR. JOHN C. WILSON (closing): It is believed that the shoulder joint is not stable in external rotation, as suggested by Dr. Giannestras. Complete internal rotation of the arm, with the forearm behind the back, was the only position which we found to be stable after open or closed reduction of a posterior dislocation of the shoulder. This position is not a comfortable one for the patient.

Dr. Bennett's suggestion of a displaced biceps tendon is most interesting. It is easy to understand how such a displacement of the biceps tendon could prevent stable reduction of a posterior dislocation of the shoulder. It happened not to be present in the cases under our observation in which the shoulders were opened.

Transfixion of the humeral head by means of wires placed through the spine of the scapula has proved to be a satisfactory method of maintaining the reduced humeral head in the glenoid. The procedure is simple, the patient is comfortable, and no mechanical difficulties are offered.

There are two suggestions to remember in this discussion: one is the lateral x-ray in suspected dislocation of the shoulder, and the other is the simplicity of transfixion to maintain the reduction.

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