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HABITUAL DISLOCATION OF THE SHOULDER

*A Study on the Nature and Treatment of the Disease
Including Remarks on Traumatic Dislocation.*

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Habitual dislocation of the shoulder joint is not an uncommon disease. According to *Roser* each little town has its case, so most general practitioners are bound to have one or more cases which they may be called on to reduce. Still the disease is not often met with in the ordinary surgical departments, most of the cases probably being admitted to the orthopedic hospitals.

In the following the nature and treatment of the disease will be dealt with on the basis of the literature and examinations of a material from the Orthopedic Hospital in Copenhagen, supplemented with 2 patients from Bispebjerg Hospital, Surgical Department D.

Danish literature only contains a few reports on the subject of habitual shoulder dislocation. In 1938 *Kapel* published a survey of the operative methods together with a description of a new method. In 1944 *H. Wulff* wrote a short report on the application of a special method in one case.

German literature has supplied elaborate reports on the subject, with a special view to the therapy, most operative methods being of German origin. French literature has dealt with the etiology and operative methods with application of the coracoid process as a block to the head of the humerus. Anglo-Saxon

literature does not afford much information regarding the disease, although American authors have displayed interest in its treatment and published a series of reports on the *Nicola* method and modifications.

Swedish literature possesses two very important sources for the elucidation of the nature of the disease, viz. theses by *Hermansson* and *Pettersson* from 1934 and 1942 respectively. The safest method for the surgical treatment of habitual dislocation of the shoulder was introduced by a Swede, *Hybbinette*, in 1917.

Anatomy.

The shoulder and the jaw both have a lax joint capsule and are the joints most frequently subject to dislocation. *Hyrthl* writes that the capsule of the shoulder joint is so lax that it could easily embody two humeral heads. By injecting quicksilver into the joint, *Joessel* found the content to be 28 cc. By way of comparison he measured the cubic content of the joint in a patient suffering from habitual dislocation and found that it was three times as large.

The glenoid cavity which is provided with a fibrous rim, the labrum glenoidale, has no hold on the head of the humerus, in contradistinction to what is the case in the hip joint. The coracohumeral ligament and the superior glenohumeral ligament act as reins holding the humeral head, so that the latter is pressed against the glenoid cavity by the weight of the arm (*Bondesen*).

The greater part of the capsule is covered by flat tendons which have become attached to the capsule before their insertion (mm. subscapularis, supra- and infraspinatus, and teres minor). Antero-inferiorly the capsule is not covered by tendons, but in return it is rather thick. The stability of the shoulder joint is to a great extent dependent on the flat tendons directly attached to the capsule, by *Pettersson* termed the tendon aponeurosis.

The outer mantle of muscles passing over the shoulder joint, more or less in connexion with the joint proper (mm. deltoideus, pectoralis major, teres major, latissimus dorsi, and long heads of the biceps and triceps brachii) serves as a further safeguard for the stability.

Dislocation of the Humerus.

This is the most frequent form of dislocation. According to *Bardenheuer* dislocations of the shoulder joint constitute 50 per cent of all dislocations.

The various forms are axillary, preglenoidal, dorsal, and supracoracoid dislocations, the two last-mentioned, however, being very rare and not dealt with in the present work. *In the following, the term dislocation of the shoulder, traumatic as well as habitual, refers to anterior and inferior dislocation.* These two varieties are rarely distinguishable mutually, an axillary dislocation after secondary upwards displacement of the humeral head being exactly like a preglenoidal dislocation.

According to *Hermodsson* 5 per cent of all primary dislocations are likely to become habitual later.

In order to elucidate habitual dislocation certain facts concerning the traumatic dislocation will be mentioned.

Age.

Habitual dislocation of the shoulder is a phenomenon of youth. The *first dislocation* as a rule occurs before the age of 30. *Alibert* found that 90 per cent occurred before the age of 30 and 49 per cent before the age of 20. The average age at the time of the primary dislocation has been found to be as follows: *Seidel* 24, *Maurer* 25, *Hermodsson* 29, and *Pettersson* 29. In the writer's material it was 22.5, varying from 14-40.

The *traumatic* dislocation usually occurs at a more mature age. *Hermodsson* and *Pettersson* found an average age of 53 and 51 respectively. 5 per cent of the primary dislocations which later may become habitual are presumably included in this calculation of the average age.

Accordingly, with regard to age there is a marked difference between habitual and traumatic dislocations.

Sex.

The males outnumber the females in case of habitual as well as traumatic dislocation. In habitual dislocation the frequency for males is stated to be 60-80 per cent and in traumatic dislocation 60-87 per cent.

In the writer's material 57 per cent were males.

The higher male frequency in both forms of dislocation seems to indicate that the trauma plays a certain part in the acquisition of habitual dislocation.

Right-Left.

In *Hermodsson's* and *Pettersson's* materials there were 31 cases of right-sided, 24 of left-sided, and 2 of bilateral *habitual* dislocation. Furthermore, there were 87 cases of right-sided and 86 of left-sided *traumatic* dislocation.

The writer's material contains 14 cases of right-sided and 7 cases of left-sided habitual dislocation. 1 patient had had a bilateral primary dislocation, but only acquired habitual dislocation on one side.

Alibert found that in 12 per cent of the patients with habitual dislocation it was bilateral, which indicates that the constitution plays a rôle in the origin of habitual dislocation of the shoulder.

On the other hand the higher frequency on the right side is suggestive of trauma.

Epilepsy.

Habitual dislocation of the shoulder was, especially formerly, a common affliction of epileptics. The dislocations occur during the fits, either caused by the fall or by the muscle spasms alone.

In the case of epileptics the treatment of habitual dislocation is particularly difficult, the tendency of recurrence being extremely great during the seizures.

Formerly 25-30 per cent of the patients with habitual dislocation of the shoulder were epileptics (*Alibert*: 35 among 112), but in recent years the frequency of habitual shoulder dislocation in epileptics has decreased considerably on account of the fact that the modern treatment of epilepsy reduces the number of the convulsions. (Personal communication from *Stubbe Teglbjerg, M.D.*, Chief of the Philadelphia Hospital for Epileptics, Dianalund, Denmark).

Hermodsson's and *Pettersson's* materials from recent years only contain 6 epileptics among 52 patients (11 per cent).

In the writer's material there are 2 epileptics among 3 patients treated with the old method of capsulorrhaphy, whereas the remainder of the material only contains 2 epileptics from among 18 patients.

The Primary Dislocation.

In a number of cases the first of a series of recurrent dislocations is caused by an injury so slight that the term traumatic dislocation cannot be applied. *Berger* had a patient who sustained a primary dislocation when putting on his overcoat, and *Hermodsson* and *Pettersson* have reported cases acquired by swimming.

The writer's material contains 2 patients who incurred their primary dislocations when plunging into a swimming pool, one with head and one with legs foremost. In so plunging they had raised their arms above their heads with a rapid movement which caused the dislocation. *Hermodsson* has described the same phenomenon in the case of one patient. A third patient of the writer's material acquired her primary dislocation by stretching her arm out sideways when washing the floor.

In most cases, however, a real trauma has been the cause of the primary dislocation, so that it practically speaking may be termed traumatic. It is indistinguishable from the 95 per cent traumatic dislocations which do not develop into habitual dislocations of the shoulder.

The Mechanism of the Traumatic Dislocation.

The most frequent cause of dislocation presumably is a forced abduction, especially with a checked external rotation in the shoulder joint. The greater tuberosity striking against the acromion or the upper margin of the glenoid cavity on account of the checked external rotation in abduction may tip the humeral head over the antero-inferior margin of the glenoid cavity by lever action. If the humeral head remains in this position it is a case of luxatio erecta, but nearly always the arm is lowered down alongside the body moving the head of the humerus upwards to the anterior side of the scapular neck.

The dislocation also may be caused by a motion of abduction in connexion with an impact in the longitudinal axis of the humerus, e.g. by a fall on the elbow. The head is then tilted over the anterior margin of the glenoid cavity. Finally, the dislocation may be caused by direct injury to the shoulder.

Lesions Arising from Acute, Traumatic Dislocation.

In spite of the relative frequency of shoulder dislocation there are but few autopsy reports describing the lesions occasioned. The majority of the reports date back from the last century (*Malgaigne* 1855, *Reuss* 1866, *Deuerlich* 1874, *Joessel* 1874 and 1880, and *Bardenheuer* 1886) whereas the 20th century has produced remarkably few (*Böhler* 1918 and *Wette* 1927).

All these authors found injuries to the capsule. In some cases there was an almost total avulsion along the entire circumference of the head or of the glenoid cavity, and in all cases there was injury on the antero-inferior side.

It appears that the capsule is not as wide as that of the jaw, which permits of a dislocation without laceration of the capsule.

In most cases there were ruptures of the tendon aponeurosis serving the supraspinatus and the infraspinatus, and in several cases there was a fracture of the greater tuberosity which frequently had been displaced upwards to a site below the acromion.

Lesion to the posterior superior side of the humeral head, close to the anatomical neck, has been described by *Malgaigne*, *Deuerlich*, *Bardenheuer*, and *Wette* as well as by *Denonvilliers* (cited by *Malgaigne*). The last-mentioned author found a comminution of the posterior side of the head making the transverse diameter 1 cm. shorter than the vertical one, whereas the other writers mentioned found a more shallow impression.

In one patient *Deuerlich* found a fracture of the antero-inferior margin of the glenoid cavity.

At the Bispebjerg Hospital, Dep. F., the writer had the opportunity of examining the injuries caused by traumatic dislocation in a 77-year old man who died 6 days after a traffic accident on the 19th December 1943, on which occasion he sustained a fracture of the skull and a leftsided preglenoidal dislocation of the shoulder. The dislocation was reduced shortly after the hospitalization.

Autopsy revealed a fracture of the skull and contusion of the brain on the right side. Furthermore universal arteriosclerosis.

Antero-inferiorly the left shoulder joint was surrounded by extravasation. The capsule was torn off the head on the lower half of the anterior side and part of the lower half of the posterior side. In the lower edge of the supscapular tendon there was a small fissure. There

was hardly any lesion of the labrum or of the margin of the glenoid cavity.

The opening of a large subacromial bursa revealed a smooth-edged, arciform defect in the capsule, measuring 4×5 cm (Fig. 1). The defect was shaped like a Gothic window without the point of the arch. The base of the defect was formed by the anterior facet of the greater tuberosity from which the main part of the supraspinatus tendon had been torn. The thick, retracted tendon could be seen and palpated at the

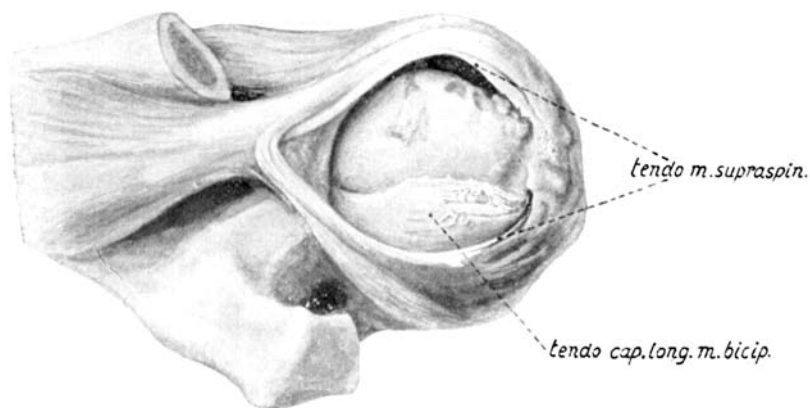


Fig. 1.

Preparation of the left shoulder of a 77-year old man. The acromion is sawed off and the supraspinatus muscle dissected. Observe the sequels of an old rupture of the supraspinatus tendon with a large capsular defect in which the somewhat frayed tendon of the biceps and the cartilage defects may be seen. The fresh lesions of the greater tuberosity are not visible.

blunt arch. At the insertion of the posterior marginal fibres there was a shell-shaped tear, as large as a pea, on the greater tuberosity.

On the lower side the infraspinatus tendon was somewhat frayed with a few small tears at the insertion.

For at space of 3 cm. before its insertion into the sulcus the tendon of the long head of the biceps was frayed along the posterior edge, but there was no rupture.

On the posterior side of the humeral head the surface was irregular and there was a cartilage erosion, but no impression fracture. Higher up a defect in the cartilage, the size of a pea, could be seen in the capsule defect. No changes in the cartilage lining of the glenoid cavity.

The autopsy thus revealed old as well as fresh changes. The defect in the capsule due to the avulsion of the supraspinatus tendon and the changes in the cartilage and the biceps tendon were old. There was no history of an earlier injury to the shoulder, but according to *Pettersson* avulsion of the supraspinatus tendon may be encountered in 18 per cent of elderly persons. The cause must be sought in a degeneration of the tendon at the site of insertion.

The fresh changes were constituted by the capsular rupture and the minor lacerations on the greater tuberosity as well as those at the site of insertion of the infraspinatus tendon. The supraspinatus tendon having been torn off beforehand, these small tears must be considered to represent a rupture of the supraspinatus tendon. Although more extensive, the lesions in the main correspond to earlier descriptions.

X-ray examinations, with and without arthrography, serve as a supplement to the post-mortem examinations.

Hermodsson made the examinations without arthrography. He examined normal shoulder joints as well as those afflicted with traumatic or habitual dislocation.

Pettersson supplemented *Hermodsson's* investigations with X-ray examinations using arthrography, with a special view to the state of the capsule.

In 80 per cent of the cases of traumatic dislocation *Hermodsson* discovered a deformity of the posterior superior part of the head of the humerus (Fig. 2). The deformity not being demonstrable in 2000 normal shoulder joints, it must be caused by the dislocation. As a rule it could only be demonstrated when using a specially suited projection. It is the same deformity which was found by the French authors *Gregoire* and *Bazy* in cases of habitual dislocation. In French literature the outlines of the humeral head on the X-ray film are compared with the outlines of an axe or halberd ("en hachette") because of a short notch just within the greater tuberosity and this was interpreted as the congenital cause of habitual dislocation. *Hermodsson* disproved this view by demonstrating the same deformity in the case of numerous traumatic dislocations. *Pettersson* did not particularly look for this deformity of the head, but still found it in 21 per cent of 99 traumatic dislocations.

Hermodsson considered that the deformity was caused by the pressure of the anterior margin of the glenoid cavity upon the humeral head, resulting in an impression fracture.

Fracture of the anterior margin of the glenoid cavity is comparatively rare (*Pettersson* 3 per cent), whereas fracture of the greater tuberosity

is a frequent complication of traumatic dislocation (*Hermodsson* 42 per cent and *Pettersson* 29.3 per cent).

By applying arthrography *Pettersson* in all cases found a lesion of the antero-inferior capsule and in 51.5 per cent a rupture of the supraspinatus tendon with connexion from the articular cavity to the peri-articular tissue, especially the subacromial bursa.



Fig. 2.

Deformity of the humeral head ("en hachette") (*Hermodsson*).

Anatomical and roentgenographic examinations have demonstrated the following lesions resulting from traumatic dislocation of the shoulder:

- (1) In all cases a lesion of the antero-inferior part of the capsule, sometimes extending further.
- (2) In about 50 per cent of the cases rupture of the supraspinatus tendon, sometimes involving the infraspinatus tendon as well.
- (3) In about 30-40 per cent of the cases fracture of the greater tuberosity.

- (4) In quite a large number of the cases (21-80 per cent) deformity of the posterior side of the humeral head, a deformity interpreted as a compression fracture caused by the anterior edge of the glenoid cavity.
- (5) In a few cases (3 per cent) fracture of the antero-inferior margin of the glenoid cavity.

Reduction of Shoulder Dislocation.

The method of reduction in general use was originally described by *Hippokrates*, but often is called the *Cooper* method.

The stretched arm is pulled in a caudal direction, the surgeon using his heel as a counter-balance in the patient's axilla. The heel fixes the scapula and at the same time exerts a pressure on the humerus in a lateral direction.

In case of failure cranial or lateral traction may be tried. Lateral traction may be effected with great force on the lower arm bent at right angles by means of a thick skein of knitting wool with a simultaneous counter-pull or -push on the scapula.

The *Kocher* method with external rotation is connected with no slight risk, the capsule and tendon aponeurosis being exposed to still greater lacerations, if it does not result in a fracture of the surgical neck. In using the *Kocher* method distinct creaking may often be heard and felt (*Bardeleben*).

Recurrence After the Primary Dislocation.

In case a patient who has had a traumatic dislocation is exposed to an adequate trauma, he may sustain a new dislocation. This may be repeated a couple of times, without it being a question of habitual dislocation.

If, on the other hand, a new dislocation is caused by a comparatively slight trauma or by a physiological movement in a youngish patient, there is likelihood of a beginning habitual dislocation.

The second of a series of recurrent dislocations as a rule occurs a short time after the first. *Hermodsson* found that 17 out of 23 patients sustained the second dislocation before the

end of a year, as a rule within the course of the first few months. More rarely it occurs years after the primary dislocation.

Thereupon the dislocations may occur with varying intervals and in between there may be subluxations accompanied by unpleasant or painful sensations.

The tendency to dislocation as a rule increases each time it happens, so the patient lives in a constant fear and consequently dares not make any major arm actions. In severe cases habitual dislocation may completely disable the patient.

The recurrences as a rule take place when the arm is moved in abduction. One of the writer's patients had a recurrence when she tried to give her son a box on the ear. Another one had such a tendency to recurrence that she had to tie the arm to her body when she went to bed.

As the tendency to recurrence increases the reduction at the same time grows easier, so a number of the patients learn to reduce the dislocations themselves without pain worth mentioning.

Lesions Caused by Habitual Dislocation of the Shoulder Joint.

The classic investigations into this subject were made by *Joessel* (in 1880) who examined a series of cases of clinically established or presumed habitual dislocations. The present paper only deals with the clinically diagnosed cases (3 including one with bilateral involvement).

In all cases *Joessel* found the capsule to be without laceration and large enough to permit of antero-inferior dislocation. At this site the capsule was thin, transparent, sometimes with a small defect. In all 4 cases the tendons of the supraspinatus and infraspinatus had been avulsed from the greater tuberosity, sometimes with a small chip of bone. In 2 cases the tendon of the long head of the biceps had been torn off from its origin and secondarily been attached to the intertubercular sulcus.

Löbker in 1887 found the same changes in the soft parts. Furthermore, he found a flat defect postero-laterally on the head of the humerus, and the anterior margin of the glenoid cavity broken off, so the surface of the joint extended on to the front of the scapular neck forming a nearthrosis. The margin between the glenoid cavity and the nearthrosis had a shape corresponding to the defect on the posterior side of the head,

for which reason *Löbker* assumed that the defect was due to a pressure erosion.

Moreover, several descriptions have been given of observations made during operations for shoulder dislocation.

In 1906 *Perthes* found the supraspinatus and infraspinatus torn off from the greater tuberosity and dilatation of the articular cavity extending to the front of the scapular neck on account of avulsion of the capsule with periosteum from the anterior margin of the glenoid cavity. *Broca* & *Hartmann* also found such a periosteal pocket.

Hybbinette and *Eden* both opened the shoulder joint anteriorly and examined the articular cavity. Apart from anterior capsular dilatation they often found injury to the labrum glenoidale, sometimes involving the edge of the bone.

The resections in use towards the end of the last century gave excellent opportunity of examining the head of the humerus, and several authors found the defect described by *Löbker* (*Cramer*, *Küster* and *Popke*). *Wendel* examined the defect histologically and found the cause to be a compression fracture.

Seidel in post-mortem examinations, however, could not demonstrate the defect mentioned, so it is not present in all cases.

By X-ray examinations *Hermodsson* and *Pettersson* have furnished a valuable supplement to the anatomical examinations of habitual as well as traumatic dislocation of the shoulder.

As mentioned above *Gregoire* and *Bazy* by X-ray examinations found a deformity of the head of the humerus in case of habitual shoulder dislocation which deformity they considered to be the cause of the dislocations.

Hermodsson found the same defect in all his 23 patients, and *Pettersson* found it in 61 per cent of 31 patients without specially looking for it. As mentioned above the same authors found the same defect following traumatic dislocation in 80 and 21 per cent of the cases respectively.

X-ray films of 6 of *Hermodsson*'s patients with habitual dislocation taken after the primary dislocation revealed the defect mentioned. No difference could be demonstrated by comparing the X-rays taken before and after a recurrence of the dislocation. *Hermodsson* considered the defect to be caused by the primary dislocation and not essentially changed by the recurrences. The investigations made by *Pettersson*, however, in-

dicate that the recurrences do play a part in the establishment of the defect.

In the writer's material the projections have been too varied to make it suitable to judge the defect.

Fracture of the greater tuberosity seems to be rare in the cases of shoulder dislocation which later become habitual. *Hermodsson* found none and *Pettersson* only 4 cases of small fractures. In *Seidel's* review of 117 cases collected from the literature there were only 5 cases of a fracture of the greater tuberosity, and usually only with a tiny chip of bone. The writer's material of 21 cases contained none with a fracture of the greater tuberosity.

Fracture of the anterior margin of the glenoid cavity has rarely been observed by X-ray. *Hermodsson* and *Pettersson* had one case each. In 2 of the writer's 21 cases the X-ray film revealed a somewhat blunt anterior margin of the glenoid cavity.

By arthrography *Pettersson* in most cases found a distinct antero-inferior dilatation of the articular cavity. In 5 of the 31 cases (16 per cent) there was a passage from the articular cavity to the para-articular tissue at this site. Rupture of the tendon aponeurosis was comparatively rare, being present in 13 per cent of the cases.

The results of anatomical and roentgenographic examinations of habitual shoulder dislocations have been as follows:

- (1) The capsule is nearly always dilated antero-inferiorly. In a number of cases the capsule is torn off the anterior margin of the glenoid cavity with periosteum at the front of the scapular neck forming a sub-periosteal pocket in connexion with the articular cavity. The subsequent dislocations always are intra-articular.
- (2) Rupture of the supraspinatus tendon is relatively uncommon in cases of habitual dislocation (13 per cent) compared with traumatic dislocation (51 per cent).
- (3) Fracture of the greater tuberosity in habitual dislocation is extremely rare ($\frac{1}{2}$ per cent) as opposed to traumatic dislocation (30-40 per cent). Furthermore, these fractures nearly always take the form of small shell-shaped chips.
- (4) Deformity on the posterior side of the humeral head as described in cases of traumatic dislocation were found in the great majority of habitual dislocations (61-100 per cent).

- (5) Fracture of the anterior margin of the glenoid cavity is rare, whereas a lesion of the anterior part of the labrum glenoidale is quite frequent. It often occurs in connexion with detachment of the capsule at this site.

Discussion Regarding the Cause of Habitual Shoulder Dislocation.

It has been demonstrated that traumatic dislocation chiefly is an affliction of the elderly (51-53), whereas the first of a series of recurrent dislocations (the primary dislocation) overtakes the younger generation (22-25).

Sometimes primary dislocation is caused by a quite slight injury or a forcible physiological movement in which cases there must have been a predisposition to dislocation, a predisposition which also is indicated by the comparative frequency of bilateral involvement.

In most cases, however, the primary dislocation is caused by a regular trauma making it indistinguishable from an ordinary traumatic dislocation. The somewhat higher frequency in the case of males (60-80 per cent) and in the right shoulder (60 per cent) also indicates the significance of the trauma.

In the case of primary dislocations lesions to bone and capsule (fracture of the greater tuberosity and rupture of the supraspinatus tendon) are considerably less frequent than in the case of traumatic dislocation. The traumatic dislocations thus seem to be divisible into ordinary traumatic dislocations and those leading up to habitual dislocation.

The anatomical reason for the evident predisposition present prior to the primary dislocation has been sought for in vain.

Grogoire, Bazy and Alibert contended that a preliminary deformity of the head of the humerus was the underlying cause of habitual dislocation.

Hermodsson proved that this deformity is present not only in all or most cases of habitual dislocation, but in a large number of the ordinary traumatic dislocations as well. The deformity must be interpreted as the consequence, not the cause of the dislocation, produced by an impression fracture of the posterior

surface of the humeral head by pressure against the anterior margin of the glenoid cavity.

In habitual dislocation the recurrences always take place after a very slight trauma or a forcible physiological movement. According to the foregoing this is very natural, considering that the predisposition to dislocation still is present.

Formerly no distinction was made between primary and traumatic dislocation and the development of traumatic into habitual dislocation has been discussed.

Perthes advanced the theory that the rupture of the supraspinatus tendon caused the habitual dislocation by reducing the stability of the joint, a theory which has been disproved by *Pettersson* who found the rupture mentioned to be less frequent in the case of habitual than traumatic dislocation.

In traumatic dislocation there is always anterior capsular rupture and in habitual dislocation nearly always anterior capsular slackening. A few cases of habitual dislocation did not display this slackening (*Cramer, Quenu, and Thomas*), so laxity of the capsule is no absolute condition of habitual dislocation.

In this connexion the importance of the treatment of traumatic dislocation to the development of habitual dislocation has been discussed. By arthrography *Pettersson* has demonstrated that the healing of the anterior capsular rupture takes several weeks, so early mobilization probably may interfere with the process of healing and thereby make the capsule lax.

In the follow-up of 157 patients treated with early mobilization after traumatic dislocation *Marbair* did not find one single case of habitual dislocation. The result of this follow-up disputes the importance of capsular dilatation and proves that the treatment of traumatic dislocation is unable to give rise to habitual dislocation.

According to *Clairmont & Ehrlich* disturbed muscular balance around the shoulder joint should constitute the cause of dislocation, but heretofore it has been impossible to obtain a further basis for this theory.

Habitual shoulder dislocation seems to be a disease based on a congenital predisposition to dislocation. Trauma is of some

importance in the case of the primary dislocation, but the nature of the affliction must be considered as being quite different from ordinary, traumatic dislocation.

THE TREATMENT OF HABITUAL SHOULDER DISLOCATION

Conservative Treatment.

Conservative treatment is indicated in cases where the patient cannot stand an operation and the disease causes much discomfort. Furthermore, it may be applied, if the patient has a prejudice against operation and the disease is so embarrassing that he is unable to manage in life.

The principle of this kind of treatment is to limit the mobility of the arm in the shoulder joint to such an extent that a dislocation cannot occur. The limitation particularly applies to abduction. Moreover, the tendency of the humeral head to move forward may be counteracted.

The easiest manner of limiting the mobility is to stitch the sleeve to the clothing a little below the armpit. The same effect may be obtained by bandages, which furthermore support the anterior side of the joint and so prevent the head of the humerus from moving forward.

None of the conservative measures are, however, fully effective, besides acting as a check on the normal arm function.

Operative Treatment.

Reports have been published describing probably about 70 different operative methods but there is no standard treatment, like the *Krogius-Goldwaith* method in the case of habitual dislocation of the patella.

As a matter of fact *Hippokratcs* first indicated an operative treatment of habitual shoulder dislocation. He cured the disease by shrinking the capsule and the soft parts of the anterior side of the joint with redhot iron.

The operative treatment has, however, only been established during the last 50-60 years, beginning with the far too radical methods of resection and arthrodesis, involving the loss of function, and ending with the fully effective modern methods preserving the normal function of the joint.

THE OPERATIVE METHODS

(1) *Capsular Plication.*

The method was applied for the first time by *Gerster* in 1883. He existed a segment of the front of the dilated capsule, whereupon he sutured the defect, the manipulations resulting in a shortening of the capsule. *Ricard-Verneuil* in 1894, applying a number of silk sutures, plicated the capsule without opening the joint. The capsule has also been split vertically, folded over, and sutured.

Plication has been applied to the entire front of the joint, including the flat tendon of the subscapular muscle.

Besides the plication, attempts have been made at strengthening the capsule in view of the theory that its anterior side is dilated and weakened. After detaching the tendons of origin of the coracobrachialis and the short head of the biceps from the coracoid process *Bardescu* transferred them to the anterior side of the joint, whereupon he sutured the tendons in front of the plicated capsule to strengthen it. For the purpose of strengthening the same place *Seidel* applied a free graft of fascia from the sheath of the abdominal rectus.

Perthes in a few cases found the capsule torn off the anterior margin of the glenoid cavity and sutured the tear with wires through the edge of the bone. *Logen* passed these wires through holes in the edge of the bone, made with a fine dental drill.

In this connexion mention should be made of *Payr's* plastic using broad flaps of fascia at the anterior and posterior side of the pectoral and deltoid muscles.

The results of capsular plication as only surgical treatment have not been all too brilliant. Among 39 non-epileptics *Thomas* had recurrences in 33 per cent and in 45 per cent of 18 epileptics. For the purpose of collecting material for a review of the results of the various methods of treatment of habitual shoulder dislocation *Anschütz* sent a questionnaire to a number of North-German surgeons and found that capsular plication had resulted in recurrences in 12 out of 53 patients = 22 per cent.

As a general rule this method is no longer applied as the only treatment of habitual shoulder dislocation, but only as a supplement to other methods like e.g. the *Oudard* and *Hybbinette* operations.

The writer's material contains 3 cases treated with capsular

plication by the *Bardescu* method from the period 1924-1929 (Table 1). One of them has had a recurrence. Capsular plication has also been applied in connexion with *Oudard* and *Hybbinette* operations.

(2) *Suspension Methods.*

The principle of these methods is to fasten the head of the humerus to the shoulder girdle in a manner not essentially limiting the mobility, but preventing the head from slipping in front of the glenoid cavity.

The first method of this kind was the operation described by *Kirschner* in 1913. He used a 25 cm. long strip of fascia lata which he passed extra-articularly below the joint and further up anteriorly as well as posteriorly and out through the deltoid where it was attached to the acromion.

Löffler passed the strip of fascia through a canal in the greater tuberosity and the acromion, tightening the strip in order that it could afford a strap for the humeral head (Fig. 3). *Henderson* of the Mayo Clinic performed the same operation, applying the tendon of the peroneus longus instead of a strip of fascia.

Joseph was the first to describe intra-articular suspension in 1919. He made a broad opening into the joint and drilled a short canal into the head. A strip of fascia was passed through this canal and fastened to the margin of the glenoid cavity at the root of the coracoid process. His idea was a ligament in analogy with the ligamentum teres femoris, although the comparison hardly applies to the mechanical action.

Hcymanowitsch described an operative method with application of the tendon of the long head of the biceps. His first method (1926) was as follows: The tendon is severed just below the intertubercular sulcus and passed through a canal in the greater tuberosity, whereupon it is fastened to the exterior side of the surgical neck of the humerus. This method is no longer in use. His second method (1929) was as follows: The proximal segment of the severed tendon is passed through a bone canal from the top of the humeral head into the intertubercular sulcus

where it is fastened to the distal segment and the surrounding periosteum.

In 1929 *Nicola* introduced this method in the U.S.A. where it is called the *Nicola* method (Fig. 3). Various modifications of this method have been introduced. *Roberts* did not sever the tendon, but mobilized it and deepened the bicipital groove extending it upwards into the humeral head. The tendon is then embedded in this groove, covered by the detached chips of bone and fastened to the periosteum (Fig. 3).

Rupp considered that a contraction of the brachial biceps could press the humeral head downwards resulting in a dislocation. He therefore fastened the tendon to the periosteum and the ligaments across the intertubercular sulcus. Actually this operation is a suspension method.

Finsterer described a so-called "muscular" method which in reality is a simple method of suspension. He mobilized a thick flap of the common origin of the coracobrachialis and the short head of the biceps preserving the supply of blood and the innervation. The flap was long enough to be passed below the joint to the posterior side, where it was fastened to the teres minor (Fig. 3).

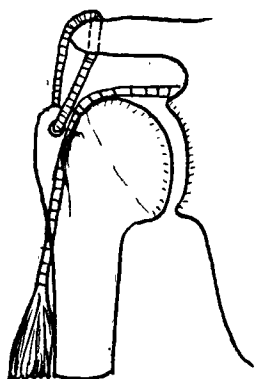
Kapel has modified the *Finsterer* method. He passes the bundle of muscles and tendons from the anterior side through a bone canal just below the head of the humerus. If possible the bundle is fastened to the acromion, otherwise to the posterior margin of the deltoid (Fig. 3).

The results of the suspension methods are relatively good.

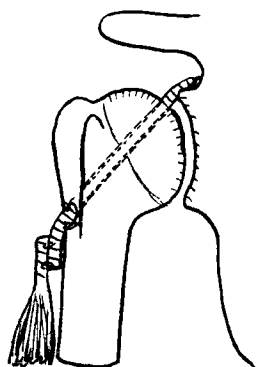
The Kirschner method: According to *Anschütz* there were 11 recurrences among 30 cases = 36 per cent.

The Löffler method: *Löffler* reported 20 cases, 13 of which had been followed up for more than 2 years. Only 1 had a recurrence. According to *Anschütz* there were 8 recurrences among 66 cases = 12 per cent. A couple of surgeons had 54 per cent recurrences out of 13 cases. *Löffler* considered this high number of recurrence to be due to inadequate tightening of the graft. Among 29 cases followed up for more than 3 years *Henderson* had 3 recurrences = 11.4 per cent.

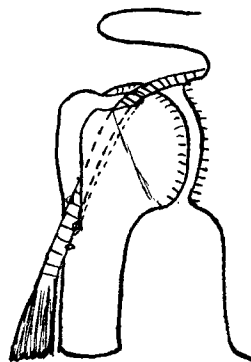
The Heymanowitsch-Nicola method was applied by *Nicola* in 42 cases, 37 of whom were followed up for more than 2 years. There were only 2 recurrences after severe trauma incidents.



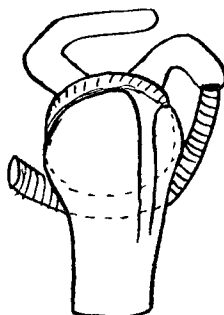
Löffler



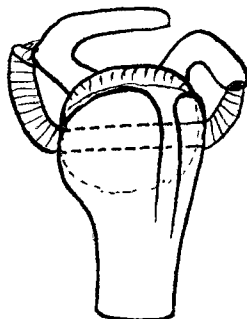
Nicola



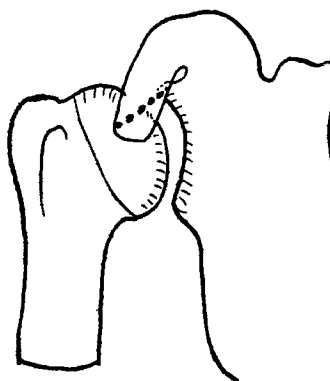
Roberts



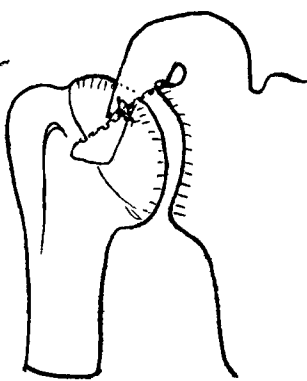
Finsterer



Kapel



Oudard



Noesske

Fig. 3.

The *Rupp* method: According to *Anschütz* 4 recurrences from among 12 cases followed up for more than 2 years = 33 per cent.

The *Finsterer* method: *Mandl* used this method in 32 cases, 24 of whom were followed up for more than 1 year. 3 had had recurrences and 3 could not be traced, i.e. a percentage of about 15.

In the writer's material the suspension method was used in 2 cases only (the *Roberts* method) as a supplement to the *Oudard* operation. One of these patients still has sublaxations and fear of dislocations without a manifest recurrence.

Summarizing the cases reported in the literature there have been 32 recurrences from among 225 cases treated with suspension = 14 per cent.

(3) *Muscular Methods.*

The muscular methods are of historical interest only. Originally they were introduced because of the view that an abnormal muscular balance around the shoulder joint should be able to cause a dislocation. *Young* therefore severed the latissimus dorsi and pectoralis major, and *Henderson* in 2 cases severed the latissimus dorsi. This method of blocking the function of certain muscles has not been used apart from the cases mentioned.

Clairmont-Ehrlich suggested muscle plastic with efficient muscular tissue. The posterior bundle of the deltoid was mobilized and passed forward below the joint between the teres major and minor. Anteriorly the bundle was fastened to the anterior part of the deltoid. The innervation being preserved they considered that the head of the humerus would be drawn backwards by an active abduction, whereby anterior dislocation could be prevented.

The review of *Anschütz* contains 12 patients operated upon by this method. 6 or 50 per cent had recurrences.

(4) *Operations on the Coracoid Process.*

These methods have aimed at creating an extra-articular check on the humeral head, thereby preventing anterior dislocation.

In 1924 *Oudard* described a method whereby the coracoid process was prolonged with a graft inferiorly and laterally, making anterior dislocation of the humeral head impossible. At the same time he plicated the capsule. The graft was a segment of the tibia, $4 \times 3 \times 1$ cm., which was inserted between the sawed off tip and the remainder of the coracoid process. A few years later *Oudard* published an easier method of obtaining approximately the same result. He prolonged the coracoid process by chiselling the bony projection along a diagonal row of drill holes, and after displacing the outmost segment it was fastened by metal suture (Fig. 3).

Reports have been published of cases which have failed to heal and others in which the prolonged coracoid process has pressed upon the brachial plexus. In the writer's material such pressure was observed in one case, for which reason it became necessary to remove the tip of the coracoid process.

The *Oudard* method is used by most French surgeons. Modifications have been introduced by *Wilmoth*, *Tavernier*, and *Steffani*, who placed a free bone graft in a groove in the coracoid process and further down into the bundle of muscle tendons consisting of the coracobrachialis and the short head of the biceps.

In the same year as *Oudard* (1924), *Noesske* published a method of displacing the coracoid process down in front of the shoulder joint and fastening it to the front of the capsule together with the tendon bundle. The first step is to detach the coracoacromial and coracoclavicular ligaments from the coracoid process, whereupon the root of the coracoid process is chiselled a little more than halfway through and broken by pressing upon the tip, thereby giving the latter a downward instead of antero-lateral direction (Fig. 3). *Noesske* has also applied capsular plication as an introductory manipulation.

According to the literature the results of the operations upon the coracoid process have been good. *Oudard* had 15 cases, 4 of whom were followed up for more than $2\frac{1}{2}$ years. There were no recurrences. In 1935 *Pfeiffer* reviewed 22 cases from the literature followed up for more than 2 years. There was only one recurrence. *Anschtütz* had 11 cases followed

up for more than 2 years with one recurrence. The *Oudard* method thus has a percentage of recurrence of 5.5.

Noesske himself operated upon 12 patients, followed up for more than 5 years. Only one had a recurrence.

The writer's material contains 11 cases treated with the *Oudard* operation (method No. 2). Apart from the already mentioned capsular plication 2 of the patients were treated with tenosuspension (*Roberts*) as a supplement to the *Oudard* operation. One of them still had sublaxations. 4 of the 9 patients not treated with suspension had recurrences. The follow-up varies from 3-9 years (Table 1).

(5) *Operations on the Glenoid Cavity, Especially the Anterior Margin.*

The methods in this group are based on the thesis that the glenoid cavity should be too shallow and its anterior margin too low to prevent anterior dislocation.

The first method is exclusively of historical interest. It was described by *Hildebrand* in 1901. He opened the joint and excavated the glenoid cavity with a chisel, whereby the protuberance of the anterior margin became larger.

The *Meyer Burgdorf* method has the same purpose. From behind he made a cuneiform osteotomy of the scapular neck and broke the bone off backwards, giving the cavity a more posterior direction and the anterior margin a greater prominence. 3 patients have been treated with this method with good results.

Independent of each other and almost simultaneously in 1917 *Hybbinette* and *Eden* for the first time used the method which must be considered to be the method of choice in case of habitual shoulder dislocation. They both inserted a bone graft in front of the anterior margin of the glenoid cavity projecting about 1-1½ cm. laterally beyond the margin. *Hybbinette* used a piece of bone from the crest of the ileum, whereas *Eden* applied a bone graft from the tibia.

Hybbinette and *Edon* both opened the joint and inserted the graft intra-articularly, but later the method was modified, i.e.

the graft is inserted inside the fibrous capsule, outside the synovial membrane (*Magnus* and *Brun*). Going further still, other authors have inserted the graft in an excavation in front of the fibrous capsule (*Heep*) or in drill holes on the scapular neck anteriorly (*Speed*).

Eden used a bone graft measuring 2×5 cm. and thick enough to be pushed into place. *Hybbinette* shaped a piece of bone of similar dimensions giving the lower edge a projection

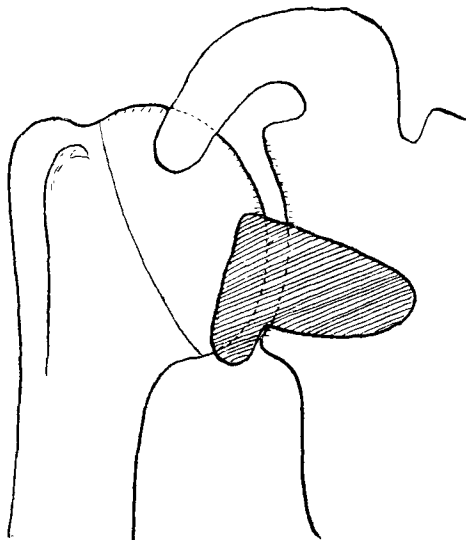


Fig. 4.

preventing it from sinking deeper than intended in front of the scapular neck (Fig. 4).

The graft was placed in a pocket between the periosteum and the bone at the lower part of the scapular neck.

Hybbinette watched the fate of the graft. He found that in some cases it had coalesced with the scapular neck, but in other cases it had disappeared as far as could be seen from the roentgen films. *Hybbinette* presumed that in the latter case the presence of the graft had caused the formation of a solid fibrous plate with a function like that of the bone. Similar observations

were made in the writer's material, the roentgen film of one of the patients 2 years after the operation not revealing a visible bone graft, but only a small bony projection at its site.

Magnus' modification of the *Hybbinette-Eden* operation must be considered to be the best method. It has been applied in the present material and a further description follows below:

An arciform incision is made along the posterior third of the opposite iliac crest. The glutei muscles are stripped off the exterior side of the ilium, whereupon a piece of bone measuring $5 \times 3 \times 1\frac{1}{2}$ cm. is chiselled off. The muscles are then sewn over the defect in the bone and the wound closed.

The affected shoulder joint is exposed with a lateral, slightly convex incision laterally to the deltoideo-pectoral groove. By holding the arm slightly in abduction and external rotation in the shoulder joint, the anterior side of the joint may be bared by retracting the deltoid laterally and the pectoralis and coracobrachialis medially. The front of the capsule is examined for laxity or weakness and the anterior margin of the glenoid cavity for abnormalities.

The fibrous capsule and the subscapular tendon are split about 3 cm. from the humeral insertion transversely on the fibres. With a *Payr* probe or a slender rugine it is possible, without opening the joint, to form a pocket in front of the lower half of the scapular neck, preferably between the periosteum and the bone.

Hereupon the graft is shaped with a bone cutting forceps making it pointed medially and projecting infero-laterally (Fig. 4). In this manner the graft is prevented from sinking deeper into the pocket. The projection is of a shape allowing the graft to protude $1-1\frac{1}{2}$ cm. laterally beyond the margin of the glenoid cavity. If possible the graft is fastened to the interior side of the fibrous capsule with 1-2 fishgut sutures.

The fibrous capsule and the subscapular tendon are sutured, the anterior side of the capsule being folded over, i.e. plicated, if possible.

The musculature is replaced by a couple of catgut sutures and the wound closed with fishgut.

Table 1.

Capsulorrhaphy

	Sex	Age 1st disl.	Age op.	Epilepsy	Occupation	Follow up	Range of motion	Recur- rence
1	F	23	25	÷	Clerk	18	full	÷
2	F	22	24	+	Housemaid	9	Ext. rot. 1/2	÷
3	F	19	26	+	Housemaid	6		+

Oudard Operation
(13 and 14 also Robert's Op.)

	Sex	Age 1st disl.	Age op.	Epilepsy	Occupation	Follow up	Range of motion	Recur- rence
4	F	32	35	÷	Wife of railway assistant	9	full	÷
5	M		31	+	Farm labourer	5	limited	+
6	M	40	50	÷	Labourer	5		÷
7	M	11	21	÷	Brewery worker	8	full	+
8	M	20	23	÷	Sailor	2		+
9	M	18	22	÷	Farm labourer	6	full	÷
10	M	27	28	÷	Coachman	3	full	+
11	M	19	26	÷	Clerk	11/2	full	÷
12	F	12	19	÷	Laundry ironer	3	full	÷
13	F	19	31	÷	Wife of tobacconist	4	ab. 85 %	÷
14	F	14	24	÷	Wife of barrister	3	full	÷ (+)

Hybbinette Operation
(17 also Oudard Operation)

	Sex	Age 1st disl.	Age op.	Epilepsy	Occupation	Follow up	Range of motion	Recur- rence
15	M		35	÷	Furniture remover	3		÷
16	M		21	÷	University student	2	full	÷
17	M	22	23	+	Saddler	5	full	÷
18	M	27	33	÷	Coachman = No. 10	2	full	÷
19	M	21	26	÷	Shopman	4	full	÷
20	M	25	27	÷	Labourer	3	full	÷
21	F	17	22	÷	Wife of labourer	2	full	÷
22	F	37	60	÷	Nurse	2	ext. rot. 2/8	÷

The arm is bandaged in plaster of paris with an abduction of 45° , a flexion of 30° , and internal rotation of 30° in the shoulder joint and right angles at the elbow joint. In the present material the bandage was left for 5-6 weeks, but according to some authors an immobilization of 3 weeks is sufficient.

After removal of the bandage the mobility is limited and exercise must be instituted.

The results of the Hybbinette and Eden operations have been exceptionally good.

Eden reported 2 cases without recurrences for 3 years.

Bandschuh followed 5 cases up for more than 1 year and found no recurrence.

Jenckel had no recurrences in 3 cases followed up for more than 3 years.

Speed reported 4 cases operated upon by *Phemister* without recurrences for more than 1 year.

In his review *Anschütz* had 11 cases without recurrences for more than 2 years.

Maurer reported 26 cases from *Magnus'* department followed up for 1-10 years without recurrences.

Wustman had 38 cases followed up for a period up to 11 years without recurrences.

Dahlgren reported *Hybbinette's* 39 cases without recurrences for more than 2 years.

Henschen had 33 cases with 1 recurrence, which in his opinion was due to a technical mishap during the operation.

Heep applied a graft in front of the fibrous capsule inserted in an excavation chiselled into the scapular neck. He had used this operation in 6 cases, but in one of them the graft was not in the correct position, and a recurrence resulted. There were no recurrences in the other cases, 3 of which were followed up for more than 2 years.

In the writer's material 8 of the patients were submitted to the *Hybbinette* operation with the modification mentioned. 2 of them had already been submitted to the *Oudard* operation. All the patients were followed up for more than 2 years, 3 for more than 3 years, and 1 for more than 5 years, and none of them had a recurrence (Table 1). 6 of these operations were performed at the Copenhagen Orthopedic Hospital, whereas the remaining 2 were performed by the writer at the Bispebjerg Hospital, Department D.

Among 169 patients submitted to the original *Hybbinette-Eden* operation there has only been one recurrence. A better result can hardly be expected.

Survey of the Operative Methods of Treatment.

It can be difficult for the surgeon who seeks a not too complicated, but effective method of treatment to choose from among the some 70 different operative methods.

As mentioned above a number of methods can be ruled out, partly because they compromise the function of the joint like the resection and arthrodesis operation, partly because they are not effective enough like capsular plication and the "muscular" methods.

The applicable methods are: suspension operations, operations on the coracoid process, and finally the *Hybbinette-Eden* operation.

The *suspension* operation may be performed with grafts of fascia or tendon or the tendons passing over the shoulder joint.

The most important ones are the *Löffler*, *Heymanowitsch-Nicola*, and *Finsterer* operations.

Without a doubt the *Heymanowitsch-Nicola* method of using the tendon of the long head of the biceps is the best one, but it requires the opening of the joint, and it may be difficult to pass the segment of tendon through the narrow canal in the head of the humerus. The modifications of this method, e.g. *Roberts'* method of placing the tendon in a chiselled groove from the sulcus into the cartilage lining of the humeral head, probably are easier, but whether they are as safe as the original method cannot be said with certainty.

According to his own report *Kapel's* modification of the *Finsterer* operation has proved to be effective, but nothing is yet known about its effectivity when performed by others. Besides, it requires a special drill.

According to the literature the results of the *operations on the coracoid process* have been good. The cases followed up for a sufficiently long period are, however, comparatively few. The

writer's material from the Copenhagen Orthopedic Hospital contains so many recurrences after the *Oudard* operation that the method is not recommendable. It is impossible to express definite views on the *Noesske* method on the basis of the few reports published.

Considering the safe results after the *Hybbinette-Eden* operation in a large number of cases reported by various authors, it must be regarded as the most effective of all operative methods.

The objection which has been raised against this method is that it is technically difficult and that untoward complications may ensue. The literature, however, does not seem to contain a report of untoward complications and as regards the technical difficulties, the operation is easier than e.g. the *Heymanowitsch-Nicola* method. Finally, no special instruments are required.

The *Magnus* modification of placing the bone graft outside the synovial membrane makes the operation more appealing to many surgeons, an opening of the joint being avoided.

The *Hybbinette-Eden* operation thus appears to possess the qualifications necessary to make it *the* method of treatment of habitual dislocation of the shoulder joint.

CASE HISTORIES

- (1) 55/24. Female, aged 25. Clerk. *Right shoulder.*

First dislocation at the age of 23. 14 recurrences in the course of the last year, each time reduced by a doctor.

In 1924 *capsulorrhaphy* of the lax capsule anteriorly and covering with the coracobrachialis and the short head of the biceps after mobilization from the coracoid process.

1942: After-examination. No recurrence. Full range of motion.

- (2) 1302/29. Female, aged 24. Housemaid. *Left shoulder.*

Epileptic. First dislocation at the age of 22 during a seizure. Since then 20 recurrences, reduced by a doctor each time.

X-ray: Nothing abnormal.

In 1929 *capsulorrhaphy* with severing of the thin and lax capsule anteriorly. Suture. The suture covered with the coracobrachialis and the short head of the biceps. Plaster bandage in abduction for 6 weeks.

1938: After-examination: No recurrence. External rotation $\frac{1}{2}$, otherwise full range of motion without pain.

- (3) 306/29. Female, aged 26. Daughter of farmer. *Right shoulder.*
Epileptic. First dislocation at the age of 19. Recurrence when she turned a page in a newspaper. Reduction under anesthesia.
X-ray: A notch on a level with the upper part of the greater tuberosity, otherwise normal conditions.
In 1929 *capsulorrhaphy* with folding over of the capsule and the tendon of the subscapularis. The suture was covered with the mobilized coracobrachialis and short head of the biceps. Plaster bandage in abduction and internal rotation for 6 weeks. Some difficulty in regaining the mobility of the joint.
In 1935 admitted to a provincial hospital for an abdominal disease. An old *recurrence of the dislocation* was discovered.
- (4) 1183/32. Female, aged 35. Wife of railway assistant. *Right shoulder.*
First dislocation at the age of 32 caused by abduction of the arm when washing the floor. 10 subsequent dislocations, a couple of times caused by boxing the children's ears. Reduction without the aid of a doctor.
1932: *Oudard operation* with capsulorrhaphy. Plaster bandage for 6 weeks.
A year later X-ray revealed the distal portion of the coracoid process to be detached, and the patient complained of paraesthesia which disappeared after removal of the fragment.
1941: After-examination: Complains of pain and a prickling sensation in the upper arm. Hyperalgesia in the upper arm and pain on palpation. Full range of motion. No recurrence.
- (5) 2323/33. Male, aged 33. Farm labourer. *Right shoulder.*
Epileptic. First dislocation during a fit. The dislocations as a rule replaced by the patient himself, a few times only he had called a doctor.
X-ray: The margin of the glenoid cavity is somewhat rough inferiorly. The right humeral head is smaller than its fellow and somewhat flattened.
1933: *Oudard operation* + capsulorrhaphy + fastening of the coracobrachialis and the short head of the biceps to the anterior side of the joint with a couple of sutures. Plaster of paris bandage for 4 weeks in 70° abduction.
1938: After-examination: *Recurrence* and pain. Limited range of motion.
- (6) 3348/33. Male, aged 50. Labourer. *Right shoulder.*
First dislocation at the age of 40 caused by pushing a motor car.

12 subsequent dislocations, reduced by a doctor. Last dislocations when putting on his braces.

X-ray: Nothing abnormal.

1934: *Oudard operation*. Plaster of paris for 1 month.

1943: Follow-up: The patient died in 1939. There had been no recurrences.

(7) 2456/33. Male, aged 20. Brewery worker. *Left shoulder*.

First dislocation at the age of 11 caused by trauma to the shoulder. Reduced by a doctor.

1934: *Oudard operation*. Plaster bandage for 2 months.

1938: After-examination: No recurrence. Could stand hard work. Full range of motion.

1942: Reports a *recurrence* on the left side.

(8) 1129/35. Male, aged 23. Sailor. *Right shoulder*.

First dislocation at the age of 20 caused by flinging the arm upwards. Since then 6 dislocations, reduced by a doctor. Subsequent dislocation when putting on his overcoat.

X-ray: Nothing abnormal.

1935: *Oudard operation*. Plaster bandage for 4 weeks.

1937: After-examination: *Recurrence* twice when moving the arm backwards.

(9) 2911/36. Male, aged 22. Farmer. *Right shoulder*.

First dislocation at the age of 18, when riding. Since then 6 dislocations, the last ones caused by e.g. throwing a ball.

X-ray: Nothing abnormal.

1936: *Oudard operation*. Plaster bandage for 6 weeks in 80° abduction and 30° flexion.

1942: After-examination: No recurrence. Some soreness when doing hard work. Full range of motion.

(10) 4234/37. Male, aged 28. Coachman. *Left shoulder*.

First dislocation at the age of 27 caused by direct trauma. Since then several dislocations and subluxations reduced by the patient himself.

X-ray: Nothing abnormal.

1937: *Oudard operation*. Plaster bandage for 6 weeks.

1937: X-ray: The coracoid process healed with optimum displacement.

1940: *Recurrence* reduced by the patient himself.

1942: *Hybbinette operation* (No. 18).

(11) 1270/39. Male, aged 26. Clerk. *Left shoulder*.

At the age of 19 the first dislocation 6 months after a traumatic

spraining of the shoulder. Since then 30-40 subsequent dislocations with ever slighter cause. Reduction by the patient.

X-ray: Nothing abnormal.

1939: *Oudard operation*. Plaster bandage for 6 weeks.

1939: X-ray: No distinct displacement of the tip of the coracoid process.

1940: Gone abroad. Up to the time of departure no recurrence or inconvenience.

- (12) 5968/39. Female, aged 19. Laundry ironer. *Right shoulder*.

First dislocation at the age of 12 caused by gymnastics. Since then frequent recurrences caused by slight movements.

X-ray: Irregular lower margin of the glenoid cavity.

1939: *Oudard operation*. Plaster bandage for 6 weeks.

1939: X-ray: A fragment, as large as a pea, detached from the remainder of the coracoid process by a 3-4 cm. broad fissure, but fastened with a metal suture.

1942: After-examination: No recurrence. Free function.

- (13) 7787/36. Female, aged 31. Wife of tobacconist. *Both shoulders*.

First dislocation in the right shoulder by trauma at the age of 19, and in the left shoulder at the age of 25. Subsequent dislocation in the right shoulder by falling off a horse at the age of 27. Since then 10 dislocations of the right shoulder almost without a trauma. Dares not move the arm for fear of dislocations.

X-ray: Nothing abnormal.

1940: *Oudard operation* + tenosuspension using the tendon of the biceps (*Roberts*). Plaster bandage for 4 weeks, after the removal of which there was a recurrence treated with reduction and bandage in abduction and internal rotation of the shoulder. Mobility somewhat limited.

1944: After-examination: No recurrence. Range of motion 85 per cent.

- (14) 6681/41. Female, aged 24. Wife of barrister. *Right shoulder*.

First dislocation caused by a fall at the age of 14. Reduced by a doctor. Since then 2 dislocations. Constant fear of dislocations.

1941: *Oudard operation* + tenosuspension (*Roberts*). Plaster bandage in 45° abduction and 20° flexion for 3 weeks.

1944: After-examination: No recurrence, but numerous subluxations. Still constant fear of dislocations.

- (15) 337/35. Male, aged 35. Furniture remover. *Right shoulder*.

No information about the first dislocation. Formerly treated elsewhere with the *Oudard* method. Since then a number of subluxations accompanied by pain for several days.

- X-ray: The metal suture intended to unite the 2 fragments of the coracoid process is separated from the central piece. Distinct anterior subluxation.
- 1935: *Hybbinette operation*. Plaster bandage for 2 months.
- 1938: X-ray: The graft is situated in the inferior angle between the humerus and scapula.
- 1938: Follow-up: No recurrence. The patient is now abroad.
- (16) 5786/36. Male, aged 21. University student. *Left shoulder*.
No information about the time of the first dislocation, which occurred by a fall when ski-ing. Replaced by a doctor. Since then 5 recurrences.
X-ray: Nothing abnormal.
1936: *Hybbinette operation*. Plaster bandage for 6 weeks.
1938: After-examination: No recurrence. Indulges in all sorts of gymnastics. Full range of motion.
X-ray: The implanted graft may be seen on the anterior side of the shoulder joint on a level with the coracoid process. No arthrosis of the joint.
1944: Gone abroad.
- (17) 5876/37. Male, aged 23. Saddler. *Left shoulder*.
Epileptic. First dislocation at the age of 22 in his sleep. Since then repeated dislocations caused by slight movements, often replaced by the patient.
X-ray: Nothing abnormal apart from anterior subluxation of the humeral head.
1937: *Hybbinette operation* + *Oudard's* plastic on the coracoid process. Plaster bandage for 6 weeks.
1938: X-ray: Position of the graft satisfactory and the coracoid process healed.
1942: After-examination: Nothing abnormal. Full range of motion.
1944: Gone abroad.
- (18) 4234/37. Male, aged 33 (patient No. 10). Coachman. *Left shoulder*.
First dislocation at the age of 27, treated at the age of 28 at the Orthopedic Hospital with the *Oudard* operation.
1937: X-ray: The coracoid process healed with optimum sideways displacement of the tip.
1940: Recurrence.
1942: *Hybbinette operation*. Plaster bandage for 6 weeks.
1944: After-examination: No recurrence. Full range of motion.
- (19) 4095/40. Male, aged 26. Shopman. *Left shoulder*.
First dislocation at the age of 21. Since then recurrences about once a year. Reduced by a doctor.

X-ray: Nothing abnormal.

1940: *Hybbinette operation*. Immobilization for 3 weeks in adduction.

1941: X-ray: The graft is in place on a level with the centre of the glenoid cavity.

1944: After-examination. No recurrence. Full range of motion without embarrassment.

(20) 28/41. Male, aged 27. Labourer. *Right shoulder*.

First dislocation at the age of 25 by trauma. Since then 9 dislocations caused by minor injuries.

X-ray: Nothing abnormal.

1941: *Hybbinette operation*. On the anterior side of the glenoid cavity there was a pouch as large as a walnut. Insertion of 2 bone grafts from the crest of the ilium, 1×4 cm. Abduction splint for 2 months. Mobilization after the course of 6 weeks.

1942: After-examination. No recurrence. Working as a navy. Practically full range of motion.

X-ray: The great has become attached to the anterior side of the scapular neck.

1944: After-examination: No recurrence. Full range of motion.

(21) 3684/41. (Bispebjerg Hosp. Dep. D). Female, aged 22. Wife of labourer. *Right shoulder*.

First dislocation at the age of 17, when diving into a swimming pool with arms foremost. Replacement by the patient herself. There have been 3 subsequent dislocations, the last one reduced under anesthesia. Numerous subluxations, so the patient has lived in a constant fear of dislocations.

X-ray: Nothing abnormal.

1941: *Hybbinette operation*. Immobilization with abduction splint for 6 weeks. X-ray revealed the graft to be situated in front of the lower part of the glenoid cavity.

1944: After-examination. No recurrence. Full range of motion.

(22) 605/42. (Bispebjerg Hosp. Dep. D). Female, aged 60. Nurse. *Right shoulder*.

First dislocation at the age of 37, caused by a sudden abduction, the patient being knocked over by an avalanche. Reduction without anesthesia. 40 subsequent dislocations as a rule reduced by the patient assisted by those present. In the years preceding the operation the patient was in a constant fear of dislocations and had to tie the arm to her body in the night to prevent dislocations.

1942: *Hybbinette operation*. Plaster bandage in slight abduction and

flexion for 4 weeks. Thereupon abduction splint for 2 weeks. X-ray after the operation revealed the graft in front of the lower half of the shoulder joint.

1944: After-examination. No recurrence. External rotation $2/3$, otherwise full range of motion.

X-ray reveals an almost complete resorption of the graft, with only a 1 cm. long, beaky projection antero-inferiorly on the scapula. No arthrosis.

SUMMARY

Habitual shoulder dislocation is no uncommon disease. 5 per cent of all primary dislocations probably later develop into habitual ones.

The present paper only deals with anterior dislocation.

As regards the time of life at which the first dislocation occurs there is a marked difference between habitual and traumatic dislocation, the first dislocation of a series taking place at the age of 22-25, whereas the ordinary traumatic dislocation occurs at a more mature age (averaging 51-53).

The primary dislocation in quite a number of cases is caused by a very slight trauma or a forcible physiological movement, a predisposition to dislocation having been present. In other cases the primary dislocation is caused by a trauma indistinguishable from one entailing an ordinary, traumatic dislocation.

In about 12 per cent of the cases habitual dislocation is bilateral, but mostly it occurs in the right shoulder (about 66 per cent) and like traumatic dislocation it is most frequent in males (60-80 per cent).

An examination of the lesions caused by habitual dislocation also displays an essential difference as compared with traumatic dislocation.

In habitual dislocation the subsequent dislocations do not entail capsular rupture like traumatic dislocation. As regards the primary dislocation it is impossible to state with certainty whether this is the case or not.

In contradistinction to traumatic dislocation rupture of the supraspinatus tendon and fracture of the greater tuberosity is comparatively rare in case of habitual dislocation.

It is evident from the foregoing that at all appearances habitual shoulder dislocation is an independent disease which is based on congenital predisposition, but may be provoked by a trauma. An anatomical or physiological basis of the constitutional disposition has not been demonstrable.

In 75 per cent of the cases the recurrences appear before the end of the first year, in most cases in the course of the first few months after the primary dislocation.

The recurrences are caused by an inadequate trauma or a forcible physiological movement, especially abduction. Thus a distinction can be made between recurrences in habitual dislocations and those of traumatic dislocation which require an adequate trauma.

Gradually the recurrences become more frequent, requiring an ever slighter cause, so the patient is disabled by the checked function of the arm on account of the tendency to dislocation and his fear of its happening.

In between the recurrences there may be subluxations accompanied by pain.

The disease may be treated without operation with a bandage holding the arm tied to the body at the expense of the function of the shoulder joint.

About 70 operative methods have been reported. Mention is made of the 3 main types in modern use: Suspension operations, operations on the coracoid process, and the *Hybbinette-Eden* operation. Capsular plication is no longer applied as an independent operation, but as a supplement to the two last-mentioned types.

The writer reviews these operative methods on the basis of reports published and his own material of 21 patients treated at the Copenhagen Orthopedic Hospital and the Bispebjerg Hospital, Department D. and arrives at the result that the *Hybbinette-Eden* method is the most effective operative method of treatment.

The *Magnus* modifications of the *Hybbinette-Eden* method of inserting the bone graft outside the synovial membrane is described in detail and recommended as a standard method.

ZUSAMMENFASSUNG

Die habituelle Schulterluxation ist kein ganz seltenes Leiden. Man kann damit rechnen, dass ca. 5 % sämtlicher erstmaliger Schulterluxationen später habituell werden.

In der vorliegenden Arbeit hat man sich nur mit Luxation nach vorne beschäftigt.

In Bezug auf das Alter bei der ersten Luxation besteht ein Wesensunterschied zwischen der habituellen und der traumatischen Luxation, indem die primäre Luxation bei habitueller Luxation im Alter von 22—25 Jahren eintritt, während die gewöhnliche traumatische Luxation ältere Menschen (im Durchschnittsalter von 51—53 Jahren) trifft.

In gar nicht wenig Fällen entsteht die primäre Luxation durch ein ganz geringes Trauma oder wird durch eine kräftige physiologische Bewegung hervorgerufen, sodass in diesen Fällen eine Disposition zur Luxation bestanden hat. In den anderen Fällen entsteht die primäre Luxation als Folge eines Traumas, das sich von dem Trauma, welches die gewöhnliche traumatische Luxation hervorruft, nicht unterscheiden lässt.

In ca. 12 % der Fälle kommt die habituelle Luxation auf beiden Seiten vor, im übrigen aber am häufigsten in der rechten Schulter (ca. 66 %), und ist wie die traumatische Luxation (60—80 %) bei Männern am häufigsten.

Eine Untersuchung von Läsionen bei habitueller Luxation im Vergleich mit Läsionen bei traumatischer Luxation hat deutlich gezeigt, dass auch auf diesem Gebiete ein Wesensunterschied besteht.

Bei Reluxationen bei habitueller Luxation findet keine Kapselruptur wie bei traumatischer Luxation statt. Es ist unmöglich, sich über diesen Umstand bei der primären Luxation mit Sicherheit zu äussern.

Ruptur der Supraspinatussehne und Fraktur von Tub. Majus ist bei habitueller Luxation im Gegensatz zur traumatischen Luxation verhältnismässig selten.

Hieraus geht hervor, dass die habituelle Schulterluxation, allem Anschein nach zu urteilen, eine selbständige Krankheit ist, die ihre Grundlage in einer angeborenen Disposition hat, aber durch ein Trauma provokiert werden kann. Man hat keine anatomische oder physiologische Grundlage für die konstitutionelle Disposition nachweisen können.

Die Rezidive beginnen in 75 % der Fälle innerhalb des ersten Jahres nach der primären Luxation, und in den meisten Fällen beginnen die Rezidive innerhalb der ersten Monate nach der primären Luxation.

Die Rezidive bei habitueller Luxation werden durch ein inadäquates Trauma oder von einer kräftigen physiologischen Bewegung, speziell Abduktion hervorgerufen. Hierdurch unterscheidet sich das Rezidiv bei habitueller Luxation von dem Rezidiv bei traumatischer Luxation, das ein adäquates Trauma erfordert.

Mit der Zeit werden die Rezidive häufiger und sind immer leichter hervorzurufen, sodass die Patienten invalidiert werden, indem die Funktion des Armes durch die Luxationstendenz und die damit verbundene Luxationsangst des Patienten behindert wird.

Zwischen den Rezidiven können Subluxationsfälle vorkommen, die sich durch Schmerzen unangenehm bemerkbar machen.

Die Behandlung kann ohne Operation durch Bandage geschehen, die den Arm an den Körper fixiert, damit aber die Funktion des Schultergelenkes hindert.

An Operationsmethoden sind ca. 70 angegeben, aber von den jetzt verwendbaren hat man die drei wichtigsten Typen besprochen: Aufhängungsoperationen, Operationen am proc. coracoideus und *Hybbinette-Eden's* Operation. Kapselnahtoperation wird jetzt nicht mehr als selbständige Operation, sondern als Ergänzung der beiden letztgenannten Typen angewandt.

Bei Beurteilung dieser Operationsmethoden auf Grundlage von Beschreibungen in der Literatur, sowie des vom Verfasser

selbst gewonnenen Materials an 21 Patienten, die im Orthopädischen Hospital zu Kopenhagen und der Abteilung D. des Bispebjerg Krankenhauses behandelt wurden, kommt man zu dem Ergebnis, dass *Hybbinette-Eden's* Methode die effektivste, operative Behandlungsmethode ist.

Die *Hybbinette-Eden'sche* Methode mit Modifikation von *Magnus*, wobei das Transplantat extrasynovial angebracht wird, wird im einzelnen beschrieben und als Standardmethode empfohlen.

RÉSUMÉ

La luxation habituelle de l'épaule n'est pas une maladie rare. On peut compter que 5 % des cas de première luxation de l'épaule deviennent plus tard habituels.

Dans ce travail, on ne s'est occupé que de la luxation en avant.

Par rapport à l'âge de la première luxation, il y a une différence essentielle entre la luxation habituelle et la luxation traumatique, étant donné que dans la luxation habituelle, la luxation primaire a lieu généralement entre 22 et 25 ans, alors que la luxation traumatique ordinaire atteint les personnes plus âgées (âge moyen 51 à 53 ans).

Dans un assez grand nombre des cas la luxation primaire est due à un trauma très léger ou à un mouvement physiologique violent, de sorte que dans ces cas il y avait une prédisposition à la luxation. Dans les autres cas, la luxation primaire est due à un trauma que l'on ne peut pas différencier de celui qui produit la luxation traumatique ordinaire.

A peu près dans 12 % des cas, la luxation habituelle est bilatérale, mais elle est d'ailleurs plus fréquente dans l'épaule droite (environ 66 %) et aussi plus fréquente chez les hommes, comme d'ailleurs la luxation traumatique (60—80 %).

Un examen des lésions de la luxation habituelle comparées aux lésions de la luxation traumatique a clairement démontré qu'il y a aussi dans ce domaine une différence essentielle.

Dans les cas de relaxation de la luxation habituelle, il n'y a pas de rupture de la capsule comme dans la luxation traumatique. Il est impossible de dire quoi que soit de certain par rapport à ce fait dans la luxation primaire.

Une rupture du supraspinal et une fracture du tub. majus sont relativement rares dans la luxation habituelle par opposition à ce qui est le cas dans la luxation traumatique.

Il ressort de ceci qu'autant qu'on puisse en juger, la luxation habituelle de l'épaule est une maladie autonome qui tire son origine d'une prédisposition congénitale, mais qui peut être provoquée par un trauma. Il n'a pas été possible de constater une base anatomique ou physiologique à cette prédisposition constitutionnelle.

Dans 75 % des cas, les récides se manifestent dans le courant de l'année qui suit la luxation primaire et, dans la plupart des cas, les récides sont observées dans les premiers mois qui suivent la luxation primaire.

Dans la luxation habituelle, les récides sont provoquées par un trauma inadéquat ou un mouvement physiologique violent, spécialement d'abduction. Ce qui différencie la récide de la luxation habituelle, de la récide de la luxation traumatique, c'est que cette dernière est provoquée par un trauma adéquat.

Avec le temps les récides deviennent plus fréquentes et sont causées de plus en plus facilement, de sorte qu'elles rendent le patient invalide, la fonction du bras étant entravée par la tendance à la luxation et par la peur de la luxation qu'éprouve le malade.

Entre les récides, il peut y avoir des cas de subluxation qui sont gênants parce qu'ils sont douloureux.

Le traitement peut avoir lieu sans opération, au moyen d'un bandage qui fixe le bras au corps, mais ceci empêche la fonction de l'articulation de l'épaule.

Environ 70 méthodes d'opération sont indiquées, mais parmi celles qui sont praticables de nos jours, trois des types principaux sont décrits: les opérations par suspension, les opérations du proc. coracoïdeus et l'opération *Hybbinette-Eden*. L'opération de la faufilure de la capsule n'est plus pratiquée maintenant en

tant qu'opération autonome, mais comme supplément aux deux derniers types mentionnés.

Dans l'appréciation de ces méthodes d'opération sur la base des descriptions données dans la littérature et le matériel d'observation de l'auteur qui comprend 21 malades traités à l'Hôpital Orthopédique de Copenhague et à l'Hôpital de Bispebjerg, Section D, on arrive au résultat que la méthode *Hybbinette-Eden* est la méthode de traitement opératoire la plus efficace.

La méthode *Hybbinette-Eden*, modifiée par *Magnus*, qui place la transplantation extrasynoviale, est décrite d'une manière détaillée et est recommandée comme méthode standard.

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