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RUPTURE OF THE ROTATOR CUFF OF THE SHOULDER

Experiences of Surgical Treatment

By

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Undisturbed, synchronous function of the glenohumeral, acromioclavicular and sternoclavicular joints and of the so-called scapulothoracic and supraglenoid joints is indispensable for normal mobility in the shoulder joint. The supraglenoid joint is formed by the acromion and the coracoid process with the coracoacromial ligament on the one hand and the rotator cuff with the biceps tendon on the other, with the subacromial bursa as joint capsule. The significance of this joint and of the smoothness of its surfaces should not be underestimated.

The muscles, whose tendons together with the joint capsule form the rotator cuff, strain the latter, and it has been assumed that the main task of the supraspinatus muscle is to pull down and fix the humeral head against the glenoid cavity when, at the initial stage of abduction, the deltoid muscle tends to displace the humerus in direction of its longitudinal axis. When *Olsson* (9) observed that after rupture of the subscapularis tendon abduction was no longer possible, he concluded that fixation is principally secured by the subscapularis and teres minor muscles. However, *da Palma* (10) demonstrated that abduction was undisturbed even after extensive lesion of the rotator cuff. By selective blocking of the suprascapularis nerve, *van Linge et al.* (5) demonstrated that as long as the rotator cuff was intact, failure of the supraspinatus function did not affect the extent, but only the strength, of abduction. They concluded that the only specific function of the supraspinatus muscle was to strain the rotator cuff and that in rupture of the cuff the functional disturbance was due to impaction of the injured tendon between the humerus and the acromion.

Rupture of the rotator cuff does not always give rise to disturbances

requiring treatment or even leading the victim to seek medical advice. Normal ageing is accompanied by degenerative processes which, in the rotator cuff, first appear at a distance of about 1 cm from the greater tuberosity where the nutrition is poorest (*Rothman et al.* (11)) and where the capsule is tightly stretched over the humeral head, while the demand for a buffer effect against the acromion is greatest in abduction. Here, both complete (full thickness) and incomplete ruptures of the rotator cuff occur and can be observed at autopsy in 20 to 30 per cent of all persons over 60 years old.

A sudden, usually traumatic rupture, however, causes functional disturbances and pain. These symptoms occur immediately but may also not appear until a few days later, possibly as a result of secondary traumatic bursitis (*Kernwein et al.* (4)). The symptoms may subside spontaneously or after conservative treatment. However, in considering da Palma's opinion that 90 per cent of all persons with rupture of the rotator cuff recover without surgical treatment, it must be remembered that his series included both complete and incomplete ruptures and that the condition cannot always be diagnosed with certainty.

Since 1933, when *Codman & Oberholzer* performed the first arthrography of the shoulder joint, the method has been developed and we have learned to diagnose total rupture of the rotator cuff arthrographically. Thus a safer basis has been obtained for prognosis, and for assessment of the results of treatment and operative indications. However, opinions are still divided as to the best method of treatment. While *Wachsmuth* (13) writes: "Reine Abrisse erfordern in fast jedem Falle eine operative Behandlung da sonst eine erhebliche Funktionseinschränkung zurückbleibt", others recommend operative treatment only when good abduction is not restored by conservative treatment for 1 to 1½ months *Da Palma* (10), 2 to 4 months *Campbell* (2) or 4 to 6 months *Debeyre et al.* (3). *Adams* (1) does not advocate operative treatment of elderly patients as a rule, and *Magnusson* (6) is of the opinion that it is contraindicated in all inveterate cases and in recent cases when the patient is over 40 years old.

In view of these opinions, I have felt it justifiable to report my experience of a series of 30 cases of rupture of the rotator cuff treated at the General Hospital, Björneborg (Pori), during the period June 1959–June 1964. In 22 operatively verified cases there was complete rupture of at least 1 cm width, while in 4 out of 8 conservatively treated cases arthrography indicated a small complete rupture and in 4 cases a probable diagnosis of "incomplete rupture" was made on the basis of

clinical examination. (Thus the conservatively treated cases were estimated to be less severe than the operatively treated and the groups are not, therefore, comparable).

The series consists of 16 men and 14 women aged 40–67 years. The average age, 56 years, was the same for men and women and likewise for both conservatively and operatively treated patients. From the point of view of age the series is not so very satisfactory.

The injury occurred in 19 cases when the patient stumbled and fell, once after a fall from a great height, 7 times in traffic accidents, once from a blow against the shoulder and once when lifting a weight. In one case pain and loss of power occurred without injury. When falling, 14 patients had hit the shoulder against the ground and 4 had stopped their fall with the outstretched hand. The remainder could not remember such details. In 3 cases the humerus was dislocated.

Subjective and objective symptoms. The predominating subjective symptom was pain and reduced active mobility. The majority of the patients complained of pain in the area of the deltoid and radiating pain along the outer aspect of the upper arm.

Clinical examination revealed reduced abduction and flexion in about 4/5ths of the cases and in the remaining cases reduced strength of these movements (in two cases there was no mention of this, however) (Figure 1).

Because of severe pain the corresponding passive movement was not measured in 13 cases. It was normal in 11 cases, 120–160° in 4 and less than 90° in 2.

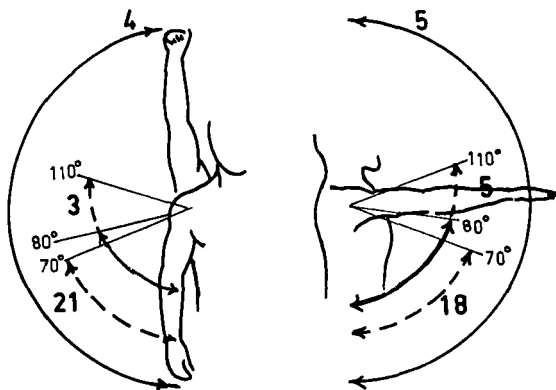


Figure 1. Schematic presentation of preoperative active abduction and flexion. The figures indicate no. of cases. Unbroken curved line indicates extent of mobility common to all cases in the respective group, a broken curved line indicating that in some cases the extent of mobility was less than in the best cases of the group.

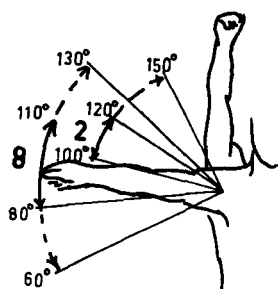


Figure 2. Schematic presentation of the zone within which pain was felt during abduction and adduction.

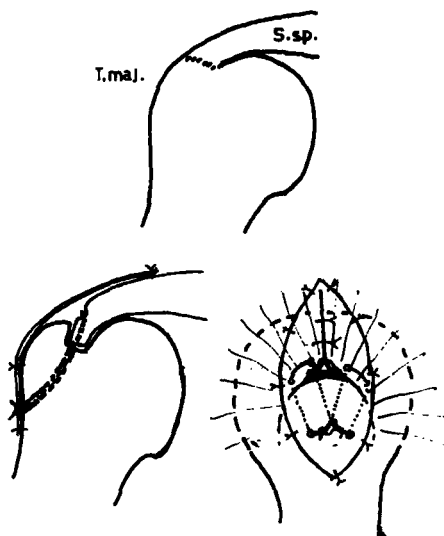


Figure 3. Schematic picture of the even transition from the greater tuberosity to an intact rotator cuff, of the unevenness that occurs when the rupture margin is anchored in a groove in the bone, and of a residual defect of the rotator cuff, and of the method according to which the defect and the unevenness were covered with a fascia graft.

Seven patients with active abduction of less than 80° were able to maintain the arm in abduction of about 120 – 150° when it had been passively raised.

In 10 patients pain at the rim of the acromion occurred, or was aggravated, on abduction or adduction within the sectors 60 – 130° or 100 – 150° (Figure 2). In 9 of these, crepitation over the acromion was simultaneously heard.

The effect of local anaesthesia was investigated in 7 cases only. In 6 of these cases active mobility improved, in 3 cases from about 40° to normal abduction and flexion.

Local tenderness to palpation over the greater tuberosity was a constant symptom. Pronounced tenderness on the ventral side of the joint in one case pointed to rupture of the subscapularis and this was verified at operation. Reduced strength of horizontal adduction gave reason to suspect such a rupture in another case. Arthrography confirmed the presence of rupture, but, since operation was not carried out, the exact position of the rupture could not be established. A clear defect in the rotator cuff could only be palpated in one patient. There was no mention of muscular atrophy.

Diagnosis. Twelve patients were examined by an orthopaedist 0–7 days after the injury, 7 patients within 8–30 days, 6 within 1–3 months and 5 within 4–14 months. The diagnosis was made at the first clinical investigation in 23 cases and was subsequently verified by arthrography and at operation in 19 of these. In 3 cases, in which the primary diagnosis was dislocation of the humerus, and in 4, which after unsuccessful conservative treatment without an exact diagnosis were referred to an orthopaedist, the diagnosis was made after treatment for some time and in all cases it was verified as above.

Treatment. Operative treatment was suggested in all cases in which conservative treatment had been unsuccessful and primarily in all cases in which complete rupture had been demonstrated with certainty. However, operation within 15 days after the injury could only be carried out in 5 cases; in the remaining cases there was an interval of 1 to 18 months (Figure 4). Operation was refused or considered contraindicated because of other diseases in 2 cases, because of contracture in 1, marked muscular atrophy in 1 and insignificant clinical symptoms and arthrographic signs of a very small though complete rupture in 4 cases. All operations were carried out by the present writer.

As soon as rupture of the rotator cuff was suspected or demonstrated, the arm was immobilized on an abduction splint until the pain had disappeared or until the patient was operated on. An abduction splint was used to enable active mobilization.

Operative method and findings. Lexer's incision detaching the deltoid from the acromion was used in 19 cases, and sabre-cut incision with osteotomy of the acromion according to Codman in 3 cases. The former incision is often accompanied by irritating haemorrhages from small arteries along the clavicle and the acromion and does not allow full exposure of a retracted supraspinatus tendon. Resection of the acromion as an additional measure was therefore necessary in 6 cases. The sabre-cut incision allows a wider field of view and causes less bleeding but the osteotomy requires osteosynthesis which may interfere with the intended early isometric muscle training.

In 20 cases rupture of the supraspinatus tendon was observed. In 13 of these cases the rupture also involved part, or all, of the infraspinatus tendon and in 2 cases also a part of the teres minor tendon and in 2 cases part of the subscapularis tendon. Rupture of the subscapularis tendon alone occurred in 2 cases. A slit from the transverse rupture along the ventral side of the supraspinatus tendon was observed in 4 cases and along its dorsal rim in 4 cases. The proximal margin of the

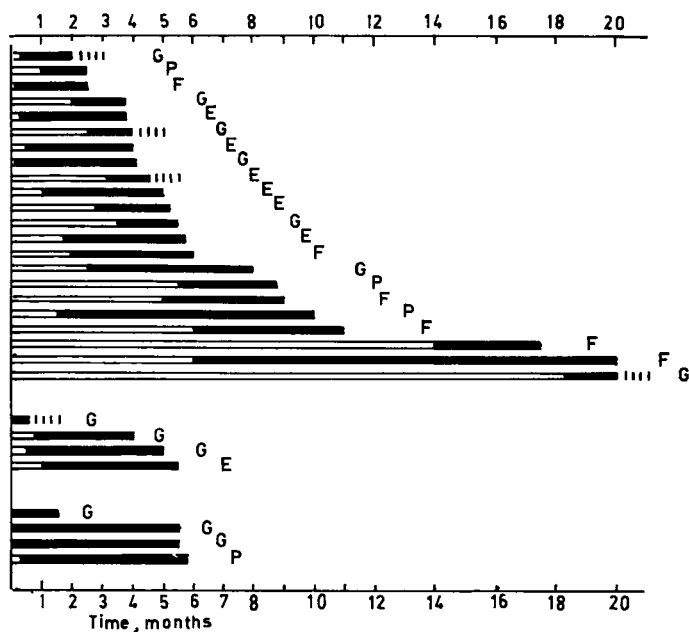


Figure 4. Diagram showing a) the interval between injury and operation and the beginning of mobilization treatment respectively (unfilled section of column), b) duration of sickleave from operation and the beginning of mobilization treatment respectively (filled section of column), c) total sick-leave (whole column), and d) the result of treatment in each case (E excellent, G good, F fair, P poor). The uppermost group of columns indicates operatively treated cases, the middle group conservatively treated and arthrographically verified cases, and the lowest group clinically diagnosed and conservatively treated cases.

rupture was more or less retracted. In one case, in which intense physical therapy had been given for 3 months and in which the rupture comprised the entire rotator cuff with the exception of the caudal part of the teres minor tendon, retraction was so marked that, despite resection of the acromion, it was impossible the reach the proximal margin of the rupture and reconstruction could not be carried out. (However, it might have been possible to carry out reconstruction according to the method published four years later by *Debeyre et al.*, i.e. mobilization and lateral displacement of the supraspinatus muscle).

In only one case did the rupture clearly comprise the area in which the blood supply is considered to be poorest, while in the remaining cases the distal stump of the tendon was shorter. This might have been the result of wear through friction against the acromion. In two cases loose cicatricial tissue was observed between the margins of the rupture,

but it was so frail that it could hardly be expected to result in lasting healing. *Kernwein et al.* (4) state that they have never seen signs of spontaneous healing. The biceps tendon, which *Samilson et al.* (12) often found, at arthrography, to be injured in connexion with rupture of the rotator cuff, was completely torn in one, and subluxated and partly torn in two cases.

Reconstructive measures. The margins of the rupture, which were, as a rule, frayed and thickened, were resected. The proximal rim was fixed with two to four mersilene sutures carried through burr holes in the bone along a groove about 1/2 cm deep chiselled cranically and, when necessary, dorsally of the greater tuberosity. The obliquely divided distal stump of the tendon was sutured with catgut over the proximal end in order to achieve as smooth a cuff surface as possible. Longitudinal ruptures were closed with chromic catgut. If retraction was too powerful to allow the entire proximal rupture margin to be fixed into the bone groove, the remaining defect was closed as completely as possible with thin mersilene and chromic catgut. I became increasingly convinced of the importance of reconstructing as smooth a surface as possible and of avoiding projection of the greater tuberosity over the cuff surface. It was evident that a persistent opening between the joint capsule and the subacromial bursa would never heal spontaneously. Therefore, in one case, in which the defect could not be completely closed, I covered both the opening and the suture line with a free fascia lata graft. The end result was good, at any rate in this one case.

Postoperative treatment. After the operation the arm was immobilized on an abduction splint or in a thoracobrachial plaster cast. Active deltoid exercises were commenced after 3–6 weeks, in 4 cases preceded by isometric contraction exercises for 2 weeks. As soon as the patient was able to lift his arm actively from the abduction splint (or the cut plaster cast) the splint was replaced by a wedge-pillow and while active exercises were continued the abduction support was gradually reduced. (Owing to a misunderstanding on the part of the staff, immobilization was interrupted twice without preceding active abduction exercises. Reoperation of one of these patients revealed that a new rupture had occurred proximally of the primary rupture and that this new rupture could no longer be closed). Active exercises were continued for 1½ to 5 months or until enough mobility and strength had been achieved that further improvement would occur at home and at work. In one case this treatment was discontinued by the patient after 2 weeks.

Pain, which rendered mobilization more difficult, occurred in 4 cases

at the greater tuberosity and in 1 at the bicipital sulcus. In all but one case the pain disappeared after one or a few injections of Lidocain and hydrocortisone.

Conservative treatment alone consisted of active mobilization, preceded, in acute cases, by immobilization for 2–4 weeks on an abduction splint. In one case with highly reduced passive mobility and arthrographically demonstrated completed rupture, mobilization was carried out by force. In 6 cases satisfactory mobility and freedom from pain were achieved after mobilization treatment of 2–4½ weeks, while in one case the treatment had to be continued for 2½ and in one for 4½ months.

The period of sick-leave in the operatively treated group was 2–20 months (average 7.8) and in the conservatively treated group 1½–6 months (average 4.6). Counted from the day of operation or the beginning of conservative treatment, the incapacity for work lasted 2–6 months (average 4.4) in the first and 1½–5½ months (average 4.5) in the second group. These figures do not include five housewives, who partly resumed their housework during the period of immobilization.

The results of treatment were estimated on the bases of a follow-up examination carried out by myself in March 1965 when the period of observation for the operatively treated patients was 13–67 months (average 35) and for the conservatively treated patients 11–32 months (average 24). At examination I considered the patients' own opinions as to whether they had become symptom-free, better or worse after the treatment, and elicited information on spontaneous pain and pain on movement, severity and localization, movements provoking pain, weakness, stiffness and the effect of the symptoms on the capacity for work, and on sleep. This information has been collected in Table 1.

The objective examination comprised measurement of active and passive mobility, strength of movement, crepitation and zones of painful movement, tenderness on palpation and muscular atrophy (Table 2). The degree of active abduction in the frontal plane was measured, as well as the maximal abduction achieved by free deviation from this plane. In the same way flexion was measured in the sagittal plane and with free deviation from it. Rotation movements were measured at three different positions, i.e. with the upper arm adducted to the body, abducted to 90° and flexed to 90°. The degree of reduction of mobility was estimated by comparison with the contralateral healthy side. A reduction of 0–15° of abduction and flexion and 0–10° of rotation was considered *normal* or *insignificant*, 20–45° and 15–30° respectively

Table 1. Subjective improvement and signs in surgically and conservatively treated cases.

		Surg.	Cons.
General impression	No complaints	6	1
	Improved	13	6
	No change or worse	3	1
Aching or pain on movement	None	6	2
	Only occasionally	11	4
	Continuously	12	1
	Continuously, disturbing sleep	3	1
Localization of pain	At acromion or undetermined	4	2
	Ventral to the joint	13	2
	Along the brachium	5	4
Movement which provokes pain *	Flexion	6	3
	Abduction	6	4
	Outward rotation	6	1
	Inward rotation	6	1
Stiffness		8	1
Weakness		7	1
Working capacity	(Almost) unchanged **	14	7
	Has changed to lighter work	6	—
	Incapable of work	2	1

* Pain provoked by movements was present in 10 surgically and 3 conservatively treated patients.

** Among these are 5 housewives and 2 old-age pensioners.

moderate and a higher reduction *considerable*. A total deviation of 0–15° from the frontal and sagittal planes respectively at maximal abduction or flexion was considered *normal* or *insignificant*, 30° was considered *moderate* and a higher degree *considerable*. The strength was measured by the weight which the patient, standing with his back against the wall and with elbow joint extended, was able to lift to 90° at abduction and flexion respectively, and comparing the result with the strength of the healthy arm. The method is admittedly inexact and does not take into account the normal difference between the “good” hand and the “poorer” hand, nor of the fact that the significance of the difference between, for instance, 5 and 1 kg on the one hand, and 15 and 11 kg on the other, is not the same, but, nevertheless, it was con-

Table 2. Residual symptoms in surgically and conservatively treated cases.
(For explanation, see text.)

Kind of treatment:			Surgical	Conservative
Active flexion	Restriction	insignificant	13	6
		moderate	4	1
		considerable	5	1
	Deviation	insignificant	20	7
		moderate	2	1
Active abduction	Restriction	insignificant	9	6
		moderate	7	1
		considerable	6	1
	Deviation	insignificant	20	7
		moderate	2	1
Restriction of active inward rotation	In abduction	insignificant	10	3
		moderate	3	3
		considerable	9	2
	In flexion	insignificant	18	6
		moderate	2	1
		considerable	2	1
	In adduction	insignificant	22	8
		moderate	—	—
		considerable	—	—
Restriction of active outward rotation	In abduction	insignificant	12	4
		moderate	7	2
		considerable	3	2
	In flexion	insignificant	11	6
		moderate	6	2
		considerable	5	—
	In adduction	insignificant	11	4
		moderate	8	1
		considerable	3	3
Reduction of strength	In abduction	insignificant	10	3
		moderate	7	3
		considerable	5	2
	In flexion	insignificant	10	3
		moderate	7	3
		considerable	5	2
Painful zone by abduction-adduction			2	—
Tenderness			2	—
Crepitation			3	1
Apparent muscular atrophy			3	—
Abnormal humeroscapular rhythm			8	1

sidered adequate as a rough measure of the degree of reduction of strength.

On the basis of subjective estimation and objective examination the results of treatment were estimated as follows:

I. *Excellent*: No subjective complaints and capable of doing previous work. No spontaneous pain; only moderate pain, if any, on straining. Extent and power of active abduction and flexion normal or insignificantly reduced. Extent and power of rotation normal or insignificantly reduced, or moderately to highly reduced in one direction only.

II. *Good*: Subjectively improved and capable of former work. Moderate pain on movement and after strain. Active abduction and flexion normal or moderately reduced, rotation only moderately reduced in all directions, or considerably reduced in one direction.

III. *Fair*: Subjectively improved, incapable of previous work but capable of continuous easier work. Moderate but persistent or frequent pain which occasionally disturbs sleep. Either: (1) moderate pain on all movements, (2) active abduction and adduction highly reduced and one of the movements highly painful, or its strength considerably reduced, or (3) rotation highly reduced.

IV. *Poor*: Subjectively unchanged or worse, cannot work for his living. Persistent pain which disturbs sleep, the extent and strength of all movements reduced and painful.

On the basis of these criteria the results of treatment were considered excellent or good in 13 of the cases treated operatively and in 7 treated conservatively, and poor in 3 cases and 1 case respectively (Figure 4).

The four cases in which the result was poor will be briefly described and the probable reason for the failure stated.

Case 1. 65-year-old woman operated one month after the injury. When post-operative mobilization was commenced, the abduction splint was removed by mistake and a new rupture occurred (see above). *Technical error and new rupture.*

Case 21. A 53-year-old man who had been treated elsewhere for over a year. Large rupture which could not be closed at operation. Postoperative pain which Lidocain-hydrocortisone injections failed to alleviate. Persistent pain, pain on movement and stiffness. Objectively moderate reduction of mobility, painful zone and crepitation. Arthrography showed persisting connexion between the joint capsule and the subacromial bursa. *Technically unsatisfactory operative result.*

Case 29. 63-year-old man operated on 5 months after the injury. Operative findings and primary operative result as in case 21. After 5 weeks' immobilization in a thoracobrahial plaster cast, the cast was removed by a colleague, who had not been adequately informed, without preceding deltoideus training. Subjectively stiffness and pain on strain, objectively all movements reduced. *Technically unsatisfactory operative result and likewise after-treatment, probably a new rupture.*

Case 24. 52-year-old man. The injury was diagnosed as an incomplete rupture within 10 days of the injury. Arthrography was planned but not carried out. Mobilization, which was commenced after 4 weeks on an abduction splint, gave good results but when the patient returned to work as a dock worker, the aching, pain on movement and weakness returned. Operation was suggested but refused. *Probably underestimation of the extent of the injury. Operative treatment might have given a better result.*

DISCUSSION

Rupture of the rotator cuff seems to be more common than is generally assumed. Particularly the possibility of rupture in connexion with dislocation of the humerus should be borne in mind. *Samilson* (12) states that ruptures with dislocation are, as a rule, smaller than those without. The fact that the two largest ruptures in my series were observed in cases of dislocation may have been due to enlargement of a primarily moderate rupture during intense active mobilization, as described by *Campbell* (2). The fact that the retraction of the proximal margin of the rupture was assessed as considerable in only 1 of the 4 cases which were operated on within 15 days of the injury, in 3 of the 6 operated on within 16–60 days, in 4 of the 7 operated on within 2–6 months and in all patients operated on later than 6 months after the injury, supports this assumption.

Earlier reports that an intact supraspinatus tendon is not an absolute condition for active abduction were verified by the fact that in two patients with full active mobility (with reduced strength) rupture of the supraspinatus and part of the infraspinatus tendon was observed. It is a common observation that rupture of the rotator cuff does not cause contracture. In one of my arthrographically verified cases the contracture may have been present before the rupture occurred.

An incision allowing adequate exposure and the possibility to reach even a far retracted rupture margin is necessary. Not even resection of the acromion close to the acromioclavicular joint, or corresponding osteotomy, is always sufficient. *Debeyre's* method is probably the best in inveterate cases.

It is of great importance that the rotator cuff should be reconstructed so that its surface becomes whole and smooth and so that the greater tuberosity does not protrude. In order to promote healing of a remaining defect of the rotator cuff, *McLaughlin* (7) recommends resection of the joint cartilage beneath the defect so that the cuff heals by attaching to the bone. However, in such cases there is no hope of regaining full

mobility. The good result which I achieved with a fascia lata graft encourages continued use of this method.

In order to reduce the risk of interference between the greater tuberosity and the acromion, McLaughlin recommends acromioplasty or division of the coracoacromial ligament. I have not been able to observe any effect on the end results in 3 cases of acromioplasty or 6 cases of resection of the acromion, except that the latter is cosmetically ungainly. I have no experience of division of the ligament.

For postoperative treatment *Campbell* (2) recommends balanced suspension until the wound has healed and then mobilization, beginning with pendular movements with the arm hanging down. *Wachsmuth* (13), *Adams* (1) and *Debeyre* (3) suggest an abduction splint or thoracobrachial plaster cast for a period of 6 to 8 weeks. Active abduction within the first 6 to 8 weeks is not, as a rule, recommended. In half my cases active abduction movements from the splint were started after as little as 3 to 4 weeks and in the remaining cases after 4 to 6 weeks. The distribution of good and poor results is identical in the two groups. It seems more important to ensure that the deltoid muscle is trained before the abduction splint is removed and that the degree of the abduction support is reduced gradually, so that stretching of the rotator cuff can be avoided, than to continue immobilization for a certain number of weeks.

If the above case in which reconstruction could not be carried out and the 2 in which a new rupture (probably) occurred are excluded, we find that when operation was performed within 15–60 days after the injury, only excellent and good results were obtained, while when operation was performed 6 months or more after the injury the result was never excellent and was good in only one case.

Preoperative mobilization treatment for 0–8 weeks was not found to have any effect on the results of treatment, but if treatment had been given for a longer period and the patient had tried to resume work before the operation, the results tend to be poorer. If there is marked muscular atrophy before operation, postoperative mobilization is delayed. The operation is technically easier to perform before the proximal margin of the rupture has retracted. The total length of sick-leave is shortened if preoperative mobilization treatment of long duration is not given.

CONCLUSIONS

Direct comparison of the operatively and conservatively treated groups is impossible, because of the difference in severity of the cases between

the two groups. My experience with the first group has convinced me, however, that when the diagnosis of complete rupture of the rotator cuff with markedly reduced mobility, reduced strength and pain on movement is certain, early operation is best. Conservative treatment is justified when symptoms are insignificant, when complete or almost complete active mobility is demonstrated after intra-articular anaesthesia, or when, for other reasons, operation or prolonged immobilization is contraindicated. I do not consider an age of over 60 years a contraindication. Co-operation with a skilful and energetic physiotherapist is essential for good results.

SUMMARY

22 cases of complete rupture of the rotator cuff were treated operatively and 8 (4 with arthrographically demonstrable complete but small rupture, and 4 with clinically diagnosed incomplete rupture) conservatively.

At operation I aimed at anchoring the cuff in a groove chiselled proximally to the greater tuberosity and at reconstructing as even and smooth a surface as possible. In one case a fascia lata graft was used for this purpose.

On the basis partly of the patient's subjective opinion and partly of objective clinical follow-up examination, the results were estimated as excellent or good in 13 operatively and in 7 conservatively treated cases. Stress is laid on the importance of postoperative immobilization in abduction, which is gradually reduced after the deltoid has been exercised.

Observations at operation and the end-results argue for early operative treatment of all cases with marked symptoms and without contraindications. An age of over 60 years is not by itself a contraindication.

RESUME

22 cas de rupture complète du muscle rotateur de l'épaule ont été traités chirurgicalement et 8 (parmi lesquels l'arthrographie a décelé une rupture complète mais petite dans 4 et le diagnostic clinique une rupture incomplète dans les autres 4) soumis à un traitement conservateur.

A l'opération, j'ai cherché à fixer le muscle dans un sillon ciselé proximalelement à la grosse tubérosité en reconstruisant une surface aussi lisse que possible. Dans un cas, une greffe de fascia lata a été utilisée dans ce but.

Partiellement sur la base de l'opinion subjective des malades et partiellement sur celle de l'examen clinique complémentaire, les résultats ont été jugés excellents et bons dans 13 des cas opérés et dans 7 des cas soumis au traitement conservateur. Les inconvénients proviennent de la durée de l'immobilisation post-opératoire en abduction, mais ont été progressivement réduits au fur et à mesure que le deltoïde a été entraîné pour reprendre sa fonction.

Les observations faites au cours de l'opération et les résultats finaux parlent en faveur d'un traitement opératoire précoce de tous les cas présentant des symptômes marquées sans contre-indication. L'âge de 60 ans ne constitue pas comme tel une contre-indication.

ZUSAMMENFASSUNG

22 Fälle von vollständiger Ruptur der Rotatormanschette wurden operativ und 8 (4 mit arthrographisch nachweisbaren vollständigen, aber kleinen Rupturen und 4 mit klinisch diagnostizierten unvollständigen Rupturen) konservativ behandelt.

Bei der Operation zielte ich darauf hin die Manschette in einer proximal von dem Tuberculum majus ausgeiselten Rinne zu verankern und bei der Rekonstruktion eine möglichst ebene und glatte Oberfläche zu erhalten. In einem Falle wurde ein Fascia lata Streifen zu diesem Zwecke verwendet.

Teilweise auf Grund der subjektiven Meinung des Patienten und teilweise auf Grund klinischer objektiver Nachuntersuchung wurden die Ergebnisse als ausgezeichnet oder gut in 13 operative und 7 konservativ behandelten Fällen angesehen. Gewicht wird auf die postoperative Ruhigstellung in Abduktion gelegt, die stufenweise nach der Aufübung des M. deltoideus vermindert wird.

Beobachtungen während der Operation und die Endergebnisse sprechen zu Gunsten einer frühzeitigen operativen Behandlung aller Fälle mit ausgesprochenen Symptomen und ohne Kontraindikationen. Ein Alter von über 60 Jahren ist an und für sich keine Kontraindikation.

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ADDENDUM

Since this article was written I have operated on 5 further cases of arthrographically verified rupture of the rotator cuff: 1 a 62-year-old man and 4 45-53-year-old women.

In case 32, a 53-year-old woman, the reconstruction was performed one week after the injury through a short incision along the lateral border of the acromion. The arm was postoperatively immobilised primarily on a wedge-pillow, later in a thoracobrachial plaster. Owing to severe obscure pain the patient could not cooperate and a contracture developed. Despite intense physiotherapy the end result 2 years after the operation was "poor" (no pain, but 50 per cent restriction of movement).

The other patients were operated by the method of Debeyre. In cases 32 and 33, operated on 1½ and 3 years after the injury, respectively, the supraspinatus muscle was advanced laterally and in case 32 the suture line in the cuff was covered with a fascia lata graft. At after-examination of case 32 one year after the operation the result was excellent". In case 33, and in cases 34 and 35, in which the reconstruction was performed within one month of the injury, the intermediate result, as judged 7, 6 and 5 months after the operation, were "fair", "excellent" and "good", respectively.

I have found the approach described by Debeyre superior to the other incisions because it allows free exposure and lateral advancement of the retracted supraspinatus muscle, without which reconstruction would have been impossible in my cases 32 and 33.