

CONSERVATIVE TREATMENT OF ACROMIOCLAVICULAR DISLOCATION EVALUATION OF FUNCTIONAL AND RADIOLOGICAL RESULTS AFTER SIX YEARS FOLLOW-UP

T. MULIER², J. STUYCK¹, G. FABRY¹

Fifty-eight patients with acute acromioclavicular dislocations of Type III, IV and V (Rockwood classification) were examined to assess the late results of conservative treatment. The average age of the patients was 31 years, and the interval between injury and final review was 6.3 years. Seventy-nine percent of the patients had excellent or good late results. Surprisingly the age and activity level of the patients did not influence our late results, nor did the radiological appearance of acromioclavicular osteoarthritis or periarticular calcification. The radiological appearance of the acromioclavicular joint improved in 41% of patients. In 10 failed cases, excision of the distal end of the clavicle with reconstruction of the coracoclavicular ligament (Weaver and Dunn procedure) resulted in 90% excellent or good results after a 3-year follow-up. A high percentage of excellent results can be expected after this procedure, as long as it is correctly performed.

Keywords : acromioclavicular ; dislocation.

Mots-clés : acromio-claviculaire ; luxation.

INTRODUCTION

Acromioclavicular dislocations and their treatment were first described in 460 A.C. by Hippocrates, but their treatment remains controversial. It is unclear whether this injury results in late functional problems and, if so, whether these can be prevented by operative treatment (2, 3, 4, 5, 7, 8, 9, 11). Many papers advocating different treatments have been published in the literature, although very few studies document the late results

after conservative treatment. Glick (3) and Dias reported no functional disability after 3 and 5 years, respectively (7).

We have studied the long-term results of a group of patients with complete acromioclavicular dislocation initially treated conservatively : 1. to evaluate the functional and radiological long-term results after conservative treatment ; 2. to analyze the failures ; 3. to evaluate the results of delayed operative treatment in these failures (by modified Weaver and Dunn technique).

MATERIALS AND METHODS

Between 1981 and 1988, 58 patients presented with acromioclavicular dislocations, of which 42 were Grade III, 5 Grade IV, and 11 Grade V, with no Grade VI. The overall follow-up period was 6.4 years, the youngest being 17 and the oldest 50 years old. The majority were less than 35 years old. The right side was injured in 32 patients, and the left in 26 patients. In 36 patients the injury was a direct blow to the anterior aspect of the shoulder. Indirect trauma was responsible for the injury in 12 cases. Twenty-six patients were involved in a traffic accident, and 32 suffered sports injuries.

¹ Department of Orthopedic Surgery, Katholieke Universiteit Leuven, UZ Pellenberg, Weligerveld 1, B-3212 Pellenberg, Belgium.

² Orthopedic Surgery, H. Hartziekenhuis Leuven, Naamsestraat 105, 3000 Leuven, Belgium.

Correspondence and reprints : T. Mulier.

Patients under 17 or over 50 years old were excluded from the study. Patients with prior symptoms in the shoulder girdle, or those with associated injuries in the same area, were also excluded.

Radiographic evaluation

X rays were evaluated according to the classification of Rockwood (16). They include the following: type I, acromioclavicular ligament disruption with slight upward migration of the clavicle and sprain of the coracoclavicular ligaments; type II, acromioclavicular ligament disruption and acromioclavicular joint dislocation with the clavicle relatively displaced upward (25% to 100% greater than normal); type IV-type III, with the clavicle displaced upward and posteriorly into or through the trapezius; type V-type III, with upward clavicular migration from 100% to 300% greater than the normal shoulder; and type VI-type III, only the clavicle is displaced downward, either under the acromion or coracoid.

All the patients were treated conservatively with a broad arm sling or taping for a period of 3 weeks, following which they were mobilized.

Assessment

All patients were evaluated clinically using the 4-grade scale of Imatani (9) (table I). Any change in occupation or level of sports activity was noted, as well as any reported difficulty in carrying loads. Any complaint about the prominence of the acromioclavicular joint was also documented.

Table I. — Imatani scale
Clinical evaluation system for acromioclavicular separation

No. of points	Distribution
<i>Pain (40 points)</i>	
40	None
25	Slight, occasional
10	Moderate, tolerable, limits activities
<i>Function (30 points)</i>	
20	Weakness (percentage of preinjury)
5	Use of shoulder
5	Vocational change
<i>Motion (30 points)</i>	
10	Abduction
10	Flexion
10	Abduction

X rays were taken of the acromioclavicular (AC) joint to assess its congruity, the presence of any degenerative changes, calcifications or remodelling in the joint. Any instability in the joint was demonstrated by taking stress x rays.

Ten patients with persistent pain and dysfunction underwent a modified Weaver and Dunn procedure (6). This consists of resection of the distal clavicle and reconstruction of the coracoclavicular ligament using the acromial end of the coracoacromial ligament as a tether for the lateral clavicle. In some patients who underwent operation, an arthrogram was performed along with stress x rays. The area of the AC joint was routinely infiltrated with local anesthetic to test for impingement.

Operative procedure

A modified Weaver and Dunn technique was used in most patients (10, 14). An 8-cm incision over the distal end of the clavicle was made, terminating at the coracoid process. Following elevation of the muscular attachments, the distal 1.5 cm of the clavicle was removed with the remnants of the acromioclavicular disc. The coracoacromial ligament was then reduced. A hole was drilled in the mid-portion of the clavicle at the level of the coracoid. In patients with a more recent injury, Vicryl was threaded through the clavicle and tied with the clavicle in the reduced position. The shoulder joint was then put through its full range of motion to check for impingement of the distal clavicle with the acromion. If impingement was noted, a small portion of the acromion was excised rather than more clavicle. The trapezius and deltoid were repaired and the wound closed with absorbable sutures. A sling was worn for 10 days, and active exercises were commenced during the second week. After 4 weeks, exercises were continued against resistance. After a period of 10 weeks, the patient was allowed to return to heavy labor or contact sports.

CLINICAL ASSESSMENT (tabl. II-III)

Overall the mean Imatani scale was 81. Excellent results (90-100) were found in 34 patients, good results (80-89) in 12, fair in 2 (70-79) and poor in 10 (< 70).

There was a minor prominence over the AC joint in 39 patients. More than 75% of patients returned to work within 4 weeks of their injury. One police officer with a grade III acromioclavicular

Table II. — End results on follow-up examination
n = 58

Excellent 90-100	Good 80-89	Fair 70-79	Poor < 70
34	12	1	11
46		12	

End results after Weaver and Dunn procedure
n = 10

Excellent	Good	Fair	Poor
7	2	0	1
9		1	

vicular dislocation had to change his occupation on account of persistent pain (fig. 2). This patient was reluctant to undergo any operative treatment. Radiographs after 16 months demonstrated a grade V dislocation and joint instability on stress views. He changed his occupation after 18 months for an administrative job. Patients whose occupation involved heavy working above head height or those who performed labour did not seem to score worse than those who had a sedentary job. Of 15 heavy labourers, excellent or good results were present in 12, and only 3 had results classified as fair or poor. Ten patients required surgical treatment because of moderate or severe persistent pain and dysfunction. In this group the Imatani rating improved from 64 preoperatively to 90 post-operatively.

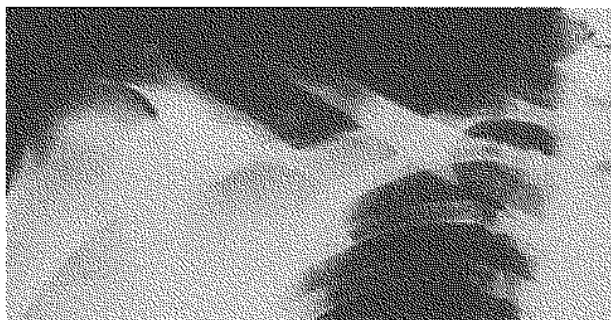


Fig. 1a

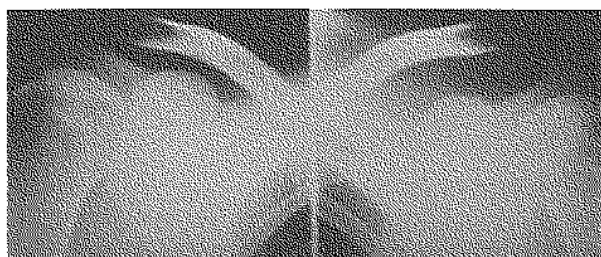


Fig. 2a



Fig. 1b

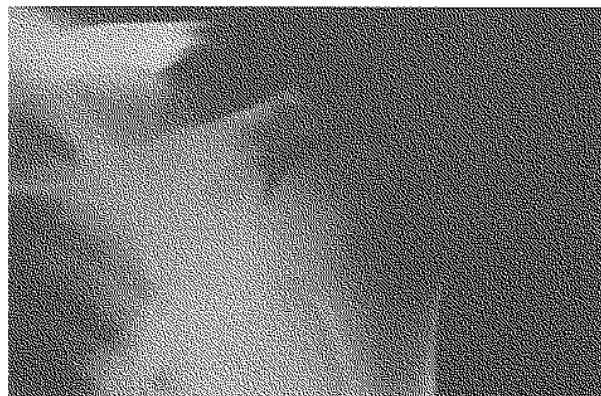


Fig. 2b

Fig. 1. — Two patients with coracoclavicular (a) and coracoclavicular and acromioclavicular (b) calcifications 8 and 14 months after conservative treatment. Both patients had no symptoms and normal range of motion.

Fig. 2. — a. Initial Rockwood type III dislocation (left side) in a 34-year-old police officer. New roentgenograms (b) later demonstrate a grade V dislocation. He was one of the four patients in whom an increase in the coracoclavicular distance was noted. This patient had a poor clinical result (Imatani rating 64) but refused operative treatment.

These patients all returned to their previous occupations 7 weeks after reconstruction, except for one butcher who lost his job because of persistent pain. He suffered a grade III dislocation of the right acromioclavicular joint. Resection by the previously described Weaver and Dunn method was performed after 9 weeks. A postoperative radiograph showed removal of too much clavicle and severe secondary ossification of the coracoclavicular ligament. The patient still complained about pain and a disturbing defect 13 months postoperatively. He was unable to continue his previous job.

Two remarkable results after the Weaver and Dunn procedure are worth noting. The first one was a 52-year-old professional dancer who suffered a right grade III acromioclavicular dislocation. Resection of the distal clavicle was carried out after 6 months because of persistent pain due to acromioclavicular arthritis. Within 4 weeks, he resumed dancing, and he continued his professional career successfully for 8 years. In the second case, a 23-year-old amateur hockey player, a Weaver and Dunn procedure was performed for the same reason, after 7 months. He resumed playing after 6 weeks, earlier than we had advised, but had no complaints in the following years (fig. 3).

X RAY ASSESSMENT (table III)

The initial x rays were classified according to Rockwood : 42 Grade III, 5 Grade IV and 11 Grade V.

At follow-up the AC joint remained completely dislocated in 27 patients, subluxated in 20 and in an anatomical position in only one. The joint was radiologically stable on stress x rays in 21 patients. In 30 patients there was an increase in the coracoclavicular distance on stress x rays, but in only 10 did this exceed 3 mm. Other radiographic

Fig. 3. — Twenty-three-year-old hockey player with a Weaver and Dunn procedure performed at 6 months because of persistent pain after a grade II-III acromioclavicular dislocation. He was training after 6 weeks, earlier than advised, without problems.

Table III. — Comparison between functional and radiological results after acromioclavicular dislocation

	Excellent Good (n = 46)	Fair Poor (n = 12)
1. Rockwood classification		
grade III n = 42	38/42	4/42
grade IV and V n = 16	8/16	8/16
2. Persistent dislocation		
grade III (n = 21)	16/21	5/21
grade IV and V (n = 6)	1/6	5/6
3. Persistent subluxation n = 21	17/21	4/21
4. Joint stability (stress x rays) n = 19	16/19	3/19
5. Major calcification n = 22	17/22	5/22
6. Acromioclavicular arthritis n = 12	8/12	4/12
7. Instability (stress x rays) n = 4 > 3 mm	1/4	3/4

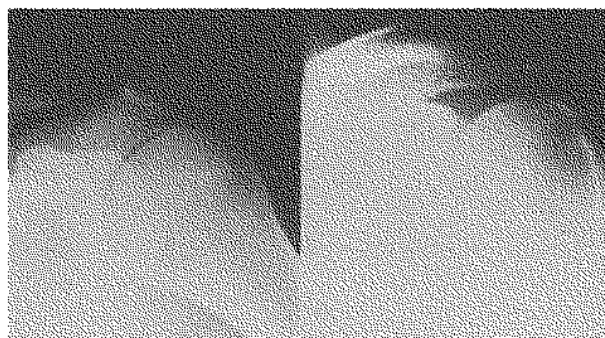


Fig. 3a

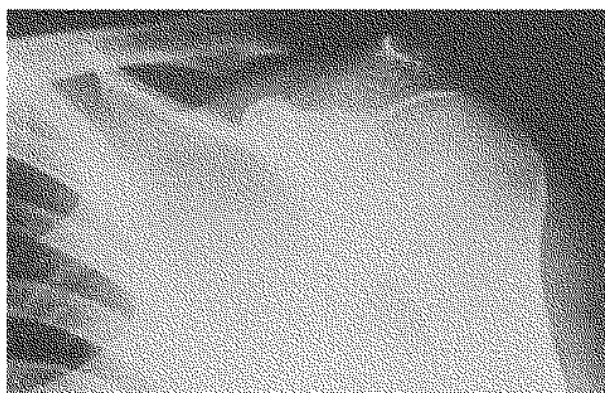


Fig. 3b

findings included major calcification in 22 patients, severe posttraumatic arthritis in 12, and some remodelling of the joint surfaces in 17. An attempt was made to correlate the clinical and radiological findings (table III). In the excellent and good group, 8 patients were found to have posttraumatic arthritis, 17 had coracoclavicular calcification and in one there was an increased coracoclavicular distance of more than 3 mm on stress x rays. Twenty-seven patients had a persistent Grade III or more, and 20 a Grade II displacement.

In the fair and poor group, 4 patients had severe posttraumatic arthritis, 5 were found to have severe calcification and 3 showed more than a 3-mm increase in the coracoclavicular distance on stress x rays.

DISCUSSION

The best treatment of complete dislocation of the acromioclavicular joint remains controversial (3, 5, 7, 9, 11, 12, 13, 14).

Powers and Beck (16) reported that operative treatment was more successful than conservative treatment. They sent a questionnaire to all orthopedic chairmen in the United States, and found that the majority treated Type III injuries by open reduction. Nonoperative treatment was generally deemed inadequate.

Proponents of surgical treatment warn of persistent instability following conservative treatment and claim a greater proportion of satisfactory results. Rockwood (16) proposed restoration of the anatomy in acute Type III, IV and V injuries in those involved in heavy labor and in certain patients between 20 and 25 years old. Neer (12) favors operative treatment depending on the activity level, health, and life expectancy of the patient, as well as the precise anatomical disruption. His treatment plan was based on observation of a number of long-term results of both operative and nonoperative treatment. Neer noted that it is impossible to be dogmatic about the necessity for treatment since some patients with long-standing AC dislocations had little pain or handicap (12). Good results were reported by Ejekkar and other authors in 85 to 90% of the operatively

treated cases (2, 10, 19). None of the operative procedures reported has shown a consistently improved outcome compared with conservative management. Most have a high incidence of complications involving the K-wires or snapping and stretching of fascial transfers (7, 11, 12, 13). Possible advantages of conservative treatment include a shorter period of rehabilitation, absence of the need for inpatient stay in hospital and, in general, satisfactory results (11). Glick *et al.* reported 85% good results following conservative treatment (5, 7, 17). Similar results have been reported by Bannister and Urist (2, 22).

In this review of 58 active patients treated conservatively 79% (42 of 58 patients) were judged to be excellent or good at a mean follow-up of 6.3 years. Ten patients who underwent a surgical procedure following initial conservative treatment were considered failures. This outcome after conservative treatment appears to be slightly worse than other long-term studies following surgical treatment (2, 8, 10, 12, 19). Most of the failures reported here came from 3 groups :

1. Those judged to have Grade IV or V dislocations initially. (If we take only Grade III we had 38/42 good results ; if we take Grade IV and V, only 8/16 good results were noted).
2. Patients with late x ray evidence of instability (> 3 mm on stress views).
3. Patients with persistent Grade III, IV or V dislocations.

In previous studies the influence of a residual degree of dislocation on the final outcome has not been noted (11, 21).

Surprisingly, age and level of sports activity did not seem to influence significantly the final outcome. A clear explanation for this last observation is not found.

In almost all previous reports, patients involved in heavy labor did score significantly worse and are sometimes considered to be an indication for immediate surgery.

— The radiographic alignment of the joint improved in 19 of the 58 patients, and in only 4 patients did the coracoclavicular separation increase significantly. In some complete sep-

arations the acromioclavicular joint seems to adapt to a new position. Levine has previously reported that the distal clavicle may even reconstitute with the passage of time (16). In one of our patients an anatomical position was found on follow-up after an initial grade III dislocation.

- X ray findings of AC arthritis or calcification did not seem to influence the final outcome. Coracoclavicular calcification occurred in 17 patients. This has previously been noted following both conservative and operative treatment regimens. Some authors have reported that calcification or ossification of the acromioclavicular or coracoclavicular ligaments is the rule rather than the exception (7, 21).
- Calcifications may appear in mild and severe lesions and are not normally evident before the third week post injury. A clear correlation between the end result and the presence of calcifications has not been established in the literature (16, 21).
- Only one patient in this series had a radiographic appearance of osteoporosis, osteolysis and tapering of the distal clavicle. Madsen first noted these changes as a rare complication and called the condition posttraumatic osteolysis of the distal clavicle. It may follow acute injury or may appear in shoulders subjected to repeated stress (16, 21).
- The primary reason for failure in patients with long-standing complete acromioclavicular dislocations of Type III, IV or V is pain. This is due to: 1) muscle fatigue through loss of the suspensory ligament, 2) incongruity of contact between the clavicle and acromion, 3) impingement through faulty scapular rotation as well as encroachment of the acromion on the supraspinatus outlet. Occasionally, the downward displacement of the coracoid causes neurological symptoms because of traction on the brachial plexus.

Failures

Ten of the 12 failures reported here subsequently had a surgical procedure similar to that described by Weaver and Dunn. This led to 90% (9 of 10

patients) good or excellent results. The results following this procedure were better when it was performed more than one year after the initial injury. No influence was found from the patient's age, occupation or the x ray appearance. Recent reports have noted satisfactory results following distal clavicular resection in young patients even after acute trauma (6, 14, 20). This procedure was previously considered only for older patients with painful and longstanding AC dislocation.

Other reports (6, 16, 20) have recommended this operation for symptomatic Types II or III dislocations only. Simple excision of the distal clavicle is only recommended for chronic symptomatic Type II injuries because the coracoclavicular ligaments are still intact. Excision of the distal clavicle is not indicated in chronic Type III dislocations since it converts a high-riding long clavicle into a high-riding short clavicle which may be more symptomatic. If the clavicle has lost its attachment to the coracoid (chronic Type III or IV injury), the coracoclavicular ligament should be reconstructed, preferably using the coracacromial ligament. It may be augmented by a lag screw.

The rewarding aspects of this operation are the lack of complications, the good results and the elimination of urgency for surgery. The deformity is removed and usually does not return. No second operations are necessary and there is no metal to break, bend or migrate. Some have stated that following this technique the patient should not return to contact sports and that the clavicle will be unstable. Our experience has been different, with 90% good-to-excellent results. As stated by Rowe (15) a high percentage of excellent results can be expected, as long as the procedure is correctly performed, with removal of no more than 1 cm of clavicle and repair of the joint capsule and muscle attachments. He reported excellent results in college and professional football and hockey players who continued at top performance levels following this technique.

CONCLUSIONS

1. Seventy-nine percent good or excellent results are obtained after conservative treatment of

complete acromioclavicular dislocations in active patients with an average follow-up of 6.3 years.

2. A satisfactory outcome can thus be expected in the majority of cases with conservative treatment, although in some studies slightly better long-term results have been reported following operative treatment (85-90%). We do think that surgery should be considered in Grade IV or V dislocations at the time of presentation and as a delayed procedure in symptomatic patients with instability.
3. The age of the patient, the type of employment and the sports activity level did not seem to influence late results. The final outcome was not influenced by late acromioclavicular arthritis or calcification.
4. Excision of the distal clavicle with reconstruction of the coracoclavicular ligament is a reliable procedure after failure of conservative treatment for symptomatic Type II, III, IV or V injuries.

Acknowledgements

We are grateful to Mr. John Timperley, FRCS, senior orthopaedic registrar, Derby, U.K. for his assistance.

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SAMENVATTING

T. MULIER, J. STUYCK, G. FABRY. Conservatieve behandeling van acromioclaviculaire luxaties. Evaluatie van de functionele en radiologische resultaten na 6 jaar follow-up.

Bij 58 patiënten met een acute type III, IV en V acromioclaviculaire luxatie (Rockwood classificatie) werden retrospectief de lange termijn resultaten nagegaan na conservatieve behandeling. De resultaten waren uitstekend en goed in 46 gevallen, matig en slecht in 12.

Noch de leeftijd, aard van werk of sport, acromioclaviculaire arthrose of periarticulaire calcificaties beïnvloedden de resultaten.

Bij de 10 mislukkingen werd een gemodificeerde Weaver en Dunn techniek toegepast. Bij negen patiënten werd een uitstekend resultaat bekomen na gemiddeld 3 jaar follow-up. Een hoog percentage uitstekende resultaten kan verwacht worden, indien deze techniek correct uitgevoerd wordt.

RÉSUMÉ

T. MULIER, J. STUYCK, G. FABRY. Traitement orthopédique des luxations acromio-claviculaires. Évaluation des résultats cliniques et radiologiques après 6 ans.

Les résultats à long terme du traitement des luxations acromio-claviculaires aiguës stades III, IV et V (classification de Rockwood) ont été revus chez 58 patients. Les résultats sont excellents et bons dans 46 cas, moyens et mauvais dans 12.

Ni l'âge, ni la nature du sport ou du traumatisme, ni l'arthrose acromio-claviculaire ni les calcifications périarticulaires n'influencent le résultat.

Dans dix échecs une opération de Weaver et Dunn modifiée fut pratiquée. Chez 9 de ces patients un résultat excellent fut obtenu avec un suivi de trois ans. Un pourcentage élevé d'excellents résultats est observé, à condition que cette technique soit réalisée correctement.