Acute grade III and IV acromioclavicular dislocations: Outcomes and pitfalls of reconstruction procedures using a synthetic ligament

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Summary
Introduction: Acromioclavicular dislocation (ACD) is frequent, at 8% of all shoulder traumas. Management in grade III lesions remains controversial. The present study assessed objective and subjective results at medium-term follow-up (mean, 60 months; range, 12—120 mo) in 27 patients managed by Ligastic® ligament reconstruction for acute dislocation.

Patients and methods: This is a multicenter, multi-surgeon retrospective study. Between 1998 and 2006, 59 patients were operated on for grade III or IV ACD, in one teaching hospital (Lille, France) and one general hospital (Tourcoing, France). Follow-up was performed by an independent (non-operator) observer. The 27 acute cases followed up underwent comparative bilateral radioclinical shoulder examination. Initial X-ray assessment found 14 grade-III (52%) and 13 grade-IV (48%) dislocations using Patte's classification.

Results: Mean Constant score was significantly lower on the operated side (82.44 vs 90.04; p < 0.05). Specific strength analysis, on the other hand, showed no significant difference with the contralateral shoulder. Coracoclavicular distance was significantly greater on the operated side (p < 0.05), with and without traction. Periprosthetic osteolysis was found in 24% of cases, and seemed to worsen over follow-up. There were no cases of fracture on osteolysis. There were no cases of sepsis or of implant intolerance. Four patients, however, required surgical revision.

Conclusion: In light of literature findings and our own experience, surgery is not to be recommended in grade-III ACD, and the authors have given up use of this device in this group due to the rate of associated osteolysis.

Level of evidence: Level IV.

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Introduction

Acromioclavicular dislocation (ACD), or separated shoulder, has been a preoccupation of physicians and surgeons for a very long time: Hippocrates himself (460—377 BC) gave a precise description. It is a frequent lesion, at 8% of shoulder traumas, especially in males, and regularly encountered in sports. Management is controversial at a number of levels, in terms both of indications and of surgical technique.

Grades I and II dislocations (Patte [1]/Rockwood [2]) are amenable to conservative management (Table 1), whereas most reports recommend surgery in Patte grade IV and Rockwood grades IV and V.

Management of grade V dislocations is a subject of controversy between advocates of conservative management and of surgery, by whatever technique.

The present study analyzed results in a series of patients undergoing synthetic ligament reconstruction for grade III or IV ACD between 1998 and 2006.

Patients and methods

Series type

This was a two-center, multi-surgeon retrospective series. Between 1998 and 2006, 59 patients were operated on for grade III or IV ACD, in one teaching hospital (Lille, France) and one general hospital (Tourcoing, France).

Series characteristics

Thirty-six patients (61%) were followed up by an independent (non-operator) observer. Twenty-three (39%) were lost to follow-up despite three successive postal reminders. Following Glorion et al. [3], lesions persisting beyond week three were considered as chronic, and were excluded (n = 9). The study population thus comprised 27 patients: 24 (89%) male, three (11%) female. Mean FU was 60 months (range, 12—120 mo), with a minimum of one year. Mean age at follow-up was 43 years (range, 28—65 yrs).

Initial trauma involved road accidents in 16 cases (59%), sports accidents in seven (26%), home accidents in three (11%) and a work accident in one (4%). Lesion was to the right shoulder in 16 cases (59%) and on the dominant side in 15 (55%). Twelve patients (46%) were manual workers, nine (35%) worked in services, and five (19%) were sedentary. Twelve (46%) had sports activity. Deformity was classified with the use of Patte [1] classification (Table 1). Initial x ray analysis found 14 grade 3 (52%) and 13 grade 4 (48%).

No patients had history of surgery to the operated shoulder. All contralateral shoulders were free of history of dislocation or instability.

Surgical technique

The patient was installed either in dorsal decubitus or semi-seated, under general anesthesia. A horizontal incision was made facing the anterior edge of the clavicle, from the acromioclavicular joint. The anterior insertion of the deltoid muscle was scraped. The synthetic ligament was inserted in a U under the coracoids, using a threader, and two anteroposterior tunnels were drilled through the clavicle using a 3.5-diameter motorized drill bit. The medial tunnel was oblique, downwards and backwards, along the medial edge of the coracoids, and the lateral tunnel was oblique, downwards and forwards; they were equidistant from the lateral edge of the clavicle and the coracoids. The ligament was threaded backwards through the lateral tunnel and forwards through the medial tunnel. Progressive reduction was achieved by lowering the clavicle and pulling on each synthetic ligament bundle, under visual control, and maintained by two polyethylene plugs impacted into either tunnel to chock the ligament (Fig. 1). The deltotrapezial fascia was located and the approach was closed over a Redon suction drain. After 10—15 days’ elbow-to-body immobilization, rehabilitation was progressively initiated, with resumption of strength-related activity as of the 3rd postoperative month.

Follow-up

Follow-up was performed by an independent observer. All 27 patients underwent clinical comparative bilateral shoulder examination. Range of motion (ROM), in all planes, and

<table>
<thead>
<tr>
<th>Grade</th>
<th>Denomination</th>
<th>Coracoclavicular distance</th>
<th>Facet deviation</th>
<th>Rockwood type</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Simple sprain</td>
<td>Normal</td>
<td>Non</td>
<td>I</td>
</tr>
<tr>
<td>II</td>
<td>Acromioclavicular dislocation</td>
<td>Normal</td>
<td>Subluxation</td>
<td>II</td>
</tr>
<tr>
<td>III</td>
<td>Scapuloaclavicular dislocation</td>
<td>&gt; 50% increase</td>
<td>Subluxation/dislocation</td>
<td>III</td>
</tr>
<tr>
<td>IV</td>
<td>Irreducible scapuloaclavicular dislocation</td>
<td>&gt; 50% increase</td>
<td>Mainly posterior</td>
<td>IV</td>
</tr>
<tr>
<td></td>
<td>Inferior dislocation</td>
<td>Negative</td>
<td>Mainly superior</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VI</td>
</tr>
</tbody>
</table>
strength were measured; functional assessment used the Constant score [4].

X-ray assessment comprised AP view of the acromioclavicular arch with and without traction (< 5 kg) and AP view in the so-called siesta posture: i.e., 90° abduction associated to external rotation.

These images enabled the coracoclavicular distance to be measured, as the vertical between the superior edge of the coracoids apophysis and the antero-inferior edge of the clavicle, and dislocation reducibility to be assessed.

Statistical analysis

Quantitative variables were expressed as means ± standard deviation (m ± sd) and as medians with 25 and 75 percentiles (med, p25-p75).

Qualitative variables were expressed as numbers and percentages (n, %), and compared by χ², or Fisher’s exact test when numbers lacked power.

Statistical analysis was performed in the Medical Information Department of Nîmes University Hospital (Dr Bousquet).

Results

Constant score

Constant scores were significantly lower on the operated side for ROM, daily life activity and pain (p < 0.05); however, no difference emerged on the strength item (Table 2).

Table 2  Mean Constant score.

<table>
<thead>
<tr>
<th>Constant score</th>
<th>Operated side</th>
<th>Healthy side</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>11.93</td>
<td>14.81</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Daily life activity</td>
<td>18.33</td>
<td>19.93</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Range of motion</td>
<td>36.67</td>
<td>39.41</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Strength</td>
<td>15.52</td>
<td>15.85</td>
<td>NS</td>
</tr>
<tr>
<td>Total</td>
<td>82.44</td>
<td>90.04</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Grade-III ACD was associated with significantly greater strength than grade-IV.

Weighted Constant scores gave 80% good and excellent results.

Resumption of activity

Twenty-six patients (96%) resumed their former job; one patient (4%) never returned to work. Mean time to resumption of work activity was 3 months (range, 1–6 mo). Eleven of the 12 sports players resumed sport at their previous level, and one at a lower level. Mean time to resumption of sports activity was 4 months (range, 0–12 mo).

Subjective results

Twenty-six patients (96%) were satisfied or very satisfied with the postoperative result. Twelve of these (44%) reported no cause of dissatisfaction.

Thirteen (48%) of the 26 patients reported one of the following causes of dissatisfaction: pain, for nine patients (33%); esthetic blemish, for two (7%); loss of strength, for one (4%); bother at work, for one (4%); and bother in sport, for one (4%).

One patient, however, (4%) was disappointed by the final results, and would refuse surgery were he to sustain a similar lesion to the other shoulder.

Radiological results

The coracoclavicular distance was significantly greater on the operated side (p < 0.005), with and without traction; traction did not significantly increase the acromioclavicular distance, whether on the healthy or on the operated side (Table 3).

Two cases (7%) showed acromioclavicular osteoarthritis, not seen on pre-operative views. No risk factors were found for onset, which moreover did not correlate with Constant score.

Coracoclavicular calcification was found in 15 patients (55%) (Fig. 2) and distal clavicular osteolysis in two (7%).

There was osteolysis facing the tunnels in almost a quarter of cases (6 patients, 22%). Osteolysis grew more severe over follow-up, with minimum onset time at 8 months postoperatively. However, no clavicular fractures were found facing the osteolyses (Fig. 3).

No correlation emerged between coracoclavicular distance and functional result.

Presence of calcification or osteolysis had no impact on Constant score in the present series.
Figure 2  Periligamentary calcifications on AP clavicle X-ray.

Figure 3  Osteolysis at implant chocking plugs on AP clavicle X-ray.

Complications

There were no cases of sepsis, nor of intolerance to material. Two patients required surgical revision, in both cases for painful recurrence. In both cases, synthetic ligament tear had been observed peroperatively. Repeat ligament reconstruction was associated to temporary pinning. The Constant score was significantly lower in these two patients.

Discussion

Study limitations comprise the retrospective design, and a follow-up rate of 61% (probably due to the multicenter nature of the study, and to geographic mobility in a relatively young population).

The strong points lie in the follow-up of objective and subjective results, with systematic X-ray check-up, performed by a single observer (reducing information bias at follow-up). Statistical analysis was entrusted to a dedicated Medical Information Department.

Management of ACD remains controversial, in terms both of indications and of surgical technique.

It would seem to be generally agreed in the literature that conservative management is indicated in grades I and II and surgery in grades IV and V (Rockwood classification [2]). For grade III management, however, there is no consensus, although the trend seems to favor
surgery in heavy manual workers and throwing-sports players.

Conservative management is universally agreed to consist in 3 weeks’ flexible elbow-to-body immobilization, followed by active-passive rehabilitation. Resumption of sports or heavy lifting is not allowed until week 6.

Rosenorn et al. [5] reported that seven of a series of nine manual workers were unable to return to their previous job after conservative treatment. These findings were confirmed by Galpin et al. [6] and Glick et al. [7] in throwing-sport players, who could not return to their previous level after conservative treatment. Further confirmation came from two prospective randomized studies (Larsen et al. [8] and Bannister et al. [9]), comparing results on conservative and surgical treatment: functional results were comparable in the two groups, with more than 80% satisfactory results.

In the conservative treatment group, however, there were fewer complications, but time to recovery of joint amplitude and resumption of work and sports activity was longer than after surgical treatment.

Other series showed better results with surgery: by plate [10] or coraco-acromial ligament reconstruction associated to resection of the lateral quarter of the clavicle [11]; cohorts, however, were small, and mean FU was 32 months.

In two large-scale reviews of the literature, Philips et al. [12] and Ceccarelli et al. [13] reported the same findings as Bannister et al. [9] and Larsen et al. [8], in favor of conservative management of grade III ACD. Phillips et al. [12] found that conservative management gave a 21% better chance of satisfactory results than did surgery, which was moreover associated with 7.1-fold more revision surgery (for initial failure, scar revision, infection) and 3.2-fold more infection. Hootman [14], however, found methodological biases in Phillips’s review [12]: heterogeneity of treatment, and longer follow-up in case of conservative management.

Literature data suggest that the benefits of surgery in grade-III dislocation are outweighed by the risks seen in the functional results. We agree with Bradley [15] that grade-III dislocation should be managed conservatively in first intention, surgery providing no more than better reduction of the piano-key blemish.

Synthetic ligament reconstruction is one of many techniques for ACD stabilization reported in the literature. The present technique was described by Laboureau et al. [16], and uses a polyester ligament threaded under the coracoids and fixed to the clavicle by means of two polyethylene plugs.

The resultant Constant score was significantly poorer on the operated side on all items except strength. Weighted Constant scores gave 80% good and excellent results. Subjectively, 86% of patients were satisfied or very satisfied with their result.

These findings are better than in series using a Dacron ligament [17–22], but are comparable to series using other surgical techniques [9,10,24].

Unlike Colosimo et al. [23] and Mathieu et al. [21], we observed no inflammatory skin reaction indicating intolerance of the ligament.

Coracoclavicular calcification or insufficient reduction had no impact on functional results, in agreement with the literature as a whole [9,17–19,22,23,25].

To our knowledge, there have been no reports of evo-lutive osteolysis. Mathieu et al. [21] reported a case of early osteolysis at 3 months, but which was non-evolutive over follow-up. However, he used rivet fixation and not impacted polyethylene plugs as in the present series, which may account for the much lower rate of osteolysis than found in the present series.

The cases of lysis in the present series seem worrying, due to the possible risk of fracture. The rate, scale and speed of onset of these lesions lead us to prolong follow-up in future, so as to assess their impact.

In the light of the present results and the literature data, we do not recommend surgery for grade-III ACD using Ligastic®-type reconstruction. The risks inherent to surgery (infection, scarring, imperfect reduction of the piano-key) do not seem acceptable given the functional results. Our subjective results were satisfactory in 86% of cases, but the objective results in terms of range of motion and pain were less good.

In the light of these findings and the literature reports, we recommend conservative first-intention management of grade-III dislocations, with surgery as a fall-back in case of failure.

Ligastic®-type synthetic ligament reconstruction in ACD gave good objective clinical and subjective results. The rate of repeat surgery, however, and especially of evolutive clavicular osteolysis cast doubt on the long-term future of this technique. The discovery of such evolutive osteolysis has led us, at least temporarily, to abandon such synthetic ligament reconstruction fixed by impacted polyethylene plugs for the treatment of grade III or IV (Rockwood or Patte) dislocation.

Conclusion

Treatment of ACD by synthetic ligament reconstruction gave satisfactory results, notably in terms of recovery of strength. Evolution, however, is not risk-free, with onset of significant periprosthetic osteolysis over short follow-up. The impact of this on shoulder function remains to be reported: in the present series, there have not yet been any associated symptoms.

In the light of these findings and the literature reports, we do not recommend surgery for grade-III ACD, except in heavy manual workers.

Surgery for grade-IV ACD is less controversial, but even so synthetic ligament reconstruction is to be resorted to with caution in the light of the present radiological findings of subsequent osteolysis.

Conflict of interest statement

None.

References