Ten-year follow-up of acute arthroscopic Bankart repair for initial anterior shoulder dislocation in young patients

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1. Introduction

Shoulder dislocation is a frequent traumatic condition, with prevalence of 24/100,000 [1] in the general population, showing 2 frequency peaks: young, often athletic subjects sustaining violent trauma, and elderly subjects sustaining falls. Standard management of initial shoulder dislocation in the young is based on 6 weeks' strict elbow-to-body immobilization in internal rotation followed by several months' rehabilitation with remobilization and muscle reinforcement. Recurrence rates are higher in under-25 year-olds, at 50% to 100% [2–5] depending on the series and population. The consequences of chronicization comprise pain and impaired activity and quality of life. Many studies have sought to define ideal management after initial anterior shoulder dislocation in young subjects, with varied non-operative treatments [6–9] and surgical techniques as of the first episode [10–12]. Several studies reported short-term benefit from Bankart anterior capsule-labrum reinsertion in young patients [11–16]. The anterior capsule-labrum complex constitutes the main mechanism of passive shoulder stabilization, and defective healing incurs a high risk of recurrence. It therefore seems logical to propose Bankart repair for initial dislocation in young patients; associated morbidity, however, is a matter of debate, with recurrence rates reaching 16% [11] after arthroscopic reinsertion.

A prospective study of early arthroscopic Bankart capsule-labrum reinsertion in initial shoulder dislocation in under-25 year-olds assessed:

- short-to-medium-term recurrence rate;
- functional outcome;
- medium-term osteoarthritis rate.

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The study hypothesis was that early arthroscopic stabilization by anterior capsule-labrum reinsertion after initial anterior shoulder dislocation is associated with low recurrence rate.

2. Patients and methods

2.1. Patients

A single-center multi-surgeon prospective study with 10 years’ minimum follow-up was performed between June 2002 and February 2004. All patients provided written informed consent, but no institutional review board application was made.

Inclusion criteria were: age ≤25 years, with initial anterior shoulder dislocation confirmed on X-ray. Exclusion criteria were: associated fracture (other than Hills-Sachs lesion) and inability to provide informed consent (parents’ consent being given for minors).

Twenty-one patients were operated on according to the study protocol, with a mean age of 20.5 years (range, 15–25 years) at surgery. The population was overwhelmingly male: 20 men, 1 woman. Dislocation was on the dominant side in 66% of cases. Five patients underwent reduction under general anesthesia and 16 in emergency without sedation. Mean dislocation-to-surgery interval was 12.1 ± 4.8 days (range, 5–25 days).

2.2. Surgical technique

Primary care consisted in reduction by external maneuver in all cases, under general anesthesia when emergency treatment failed, with elbow-to-body immobilization in internal rotation awaiting surgery.

CT-arthrography was performed systematically after reduction, and initial lesions were noted.

Surgery was performed within 30 days of trauma, comprising Bankart arthroscopic anterior capsule-labrum reinsertion [17]. Patients were under general anesthesia, in the beach-chair position with 3 kg traction in antepulsion.

Reinsertion used resorbable Panaloc™ anchors (Depuy-Mitek, Raynham, MA, USA), the number of which (minimum, 2) depended on the lesions discovered during arthroscopy, which were systematically noted (Table 1).

In the immediate postoperative course, elbow-to-body immobilization in internal rotation was implemented for 3 weeks, followed by passive and active assisted rehabilitation until ranges of motion were recovered. Return to sports was authorized at 3 months.

2.3. Assessment

Patients were regularly and prospectively followed up at 2 and 6 months and 1, 3 and 10 years. Those unable to come to the 10-year follow-up were interviewed by telephone and radiographs were sent by mail.

Follow-up consultations comprised interview and objective and subjective assessment of instability, noting any surgical revision.

Clinical examination screened for instability by overhead maneuver and relocation test.

Inferior glenohumeral ligament hyperlaxity was assessed on Gagey test [18].

Active range of motion was measured in abduction (ABD), anterior elevation (AE), external rotation elbow-to-body (EREB) and internal rotation (IR).

Walch-Duplay [19] and Rowe scores [20] were calculated. The ISIS score [21] was systematically calculated retrospectively.

AP radiographs of the affected shoulder in all 3 rotations (internal, neutral and external) and Bernageau lateral axillary radiographs were taken.

Hill-Sachs lesion and joint effusion were analyzed. The Samilson classification [22] was applied in case of signs of centered osteoarthritis of the shoulder.

At study start-up in 2002, recurrence was initially defined as new dislocation. At long-term review, a distinction was made between true dislocation and sensation of instability, both of which were noted. Range of motion was assessed against the contralateral side; internal rotation was compared noting the vertebral levels as follows: D1 = 1; D2 = 2... then L1 = 13; L2 = 14; L3 = 1; L4 = 16...

Initial ISIS score was assessed retrospectively at the last consultation.

2.4. Statistics

Quantitative variables (ranges of motion, functional scores) were compared on non-parametric Mann-Whitney test, and qualitative variables (satisfaction) on F test. Recurrence was assessed by Kaplan-Meier survival estimator, with 95% confidence intervals.

First-order risk was set at 5%. Despite the prospective study design, there were missing data, but this did not affect study of recurrence or onset of osteoarthritis.

The correlation between recurrence and onset of osteoarthritis was assessed on Kendall correlation test, with 95% confidence intervals. First-order risk was set at 5%.

3. Results

At 10 years’ follow-up, 20 patients were re-contacted and 18 seen in clinical and radiological consultation, at a mean 9.7 years (range, 8–11 years) (Fig. 1). There were 5 cases of recurrence (25%) (all with sensation of instability); 2 other patients had sensation of instability without recurrence (Figs. 2 and 3). There were in all 7 failures (35%), taking dislocation and sensation of instability together. Three of the 5 cases of recurrence were early (<1 year): 1 epileptic seizure at 5 months, 1 brutal overhead movement and 6 months, and 1 skate-board fall at 2 months; 2 were late: 1 violent trauma during soccer at 3 years, and 1 forced overhead movement at 8 years. Only 2 of these 5 patients required surgical revision, by coracoid bone block.

Five of the 18 patients seen in consultation showed apprehension on overhead movement and positive relocation test; these were the same 5 who had recurrent subluxation.

Thirteen patients had positive Gagey test (>105°), including 4 with >120° hyperabduction; Gagey test did not correlate with recurrence in the present series.

Table 2 shows ranges of motion versus contralateral values. There was a significant difference in internal rotation, which was reduced by a mean 1 vertebral level on the operated side.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Range of motion (°) versus non-operated shoulder.</th>
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<tbody>
<tr>
<td></td>
<td>Operated side</td>
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<tr>
<td>AAE</td>
<td>176.7 ± 6.8</td>
</tr>
<tr>
<td>ABD</td>
<td>168.9 ± 6.8</td>
</tr>
<tr>
<td>EREB</td>
<td>59.4 ± 24.8</td>
</tr>
<tr>
<td>IR</td>
<td>D92.2 ± 2.6</td>
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AAE: active anterior elevation; ABD: abduction; EREB: external rotation elbow-to-body; IR: internal rotation.
Included= 21
Followed up = 20
Age = 20.5 ± 3.4 years (range, 15-25)
Gender = 20 male / 1 female
Time between dislocation and surgery = 12 ± 4.8 days (5-25)

Mean follow-up = 9.7 ± 1.1 years (11-8)
Recurrence = 7 (5+2) (35%)
- recurrence of dislocation = 5 (25%)
- subjective instability only = 2 (10%)
Other surgery = 2 (10%)

Fig. 1. Inclusion and results.

Mean Walch-Duplay score at 10 years was 88 ± 18 (range, 30–100), with 14 patients (78%) scoring ≥80, 3 (17%) scoring 40–80 and 1 scoring 30 (Fig. 4). Mean Rowe score at 10 years was 86 ± 22 (range, 35–100), with 13 patients (73%) scoring ≥90, 1 (5%) scoring 70–80, 3 (17%) scoring 40–69, and 1 (5%) scoring 35 (Fig. 5).

Mean ISIS score was 3.3 ± 1.9 (range, 0–7); 11 patients scored ≤3, 7 scored 4–6, and 2 scored >6. Patients with recurrence of true dislocation scored respectively 4.5 and 5 with early onset and 2 and 3 with late onset. Two patients scored 7 without showing recurrence. Initial ISIS score did not correlate with recurrence in the present series.

Both patients with late recurrence were satisfied with surgery and had resumed all activities without problems until recurrence occurred.

Radiology found 10 patients (18%) with humeral notching, without correlation with recurrence. Five patients showed anterior glenoid lesion on Bernageau lateral view, without correlation with recurrence.

Three patients showed Samilson 1 centered osteoarthritis: 2 without and 1 with recurrence of dislocation. Both patients without recurrence of dislocation were symptom-free, whereas the patient with recurrence experienced non-disabling pain. Recurrence did not correlate with onset of osteoarthritis of the shoulder (T = -0.275; P = 0.23).

4. Discussion

The present series showed a 35% rate of recurrence, taking together true dislocation (25%) and isolated sensation of instability (10%). This rate is better than those reported elsewhere for non-operative treatment, where it ranged between 50% and 70% in under-25-year-old [2–4].

Failures in the present series should be separated into 2 groups: early failure (before 1 year), and late. In hindsight, the patient with anterior dislocation sustained during an epileptic seizure should not have been treated with this procedure, as non-stabilized epilepsy inherently incurred a risk of recurrent dislocation. His retrospective ISIS score was 5. After the second dislocation at 5 months, he was successfully managed by coracoid bone-block. A second early recurrence was associated with defective information and follow-up: the patient had, at 1 month postoperatively, resumed a sport activity exposing him to risk of traumatic dislocation: he had sustained initial trauma while skate-boarding, and then a second trauma while skate-boarding at 3 months. His

Fig. 2. Survival curve censored on recurrence of dislocation (years).

Fig. 3. Survival curve for recurrence censored on dislocation and subluxation (years).

Fig. 4. 10-year Walch-Duplay score [19].

Fig. 5. 10-year Rowe score [20].
retrospective ISIS score was 5. In the third case of early recurrence, there were no clear risk factors; his ISIS score was 4.

Of the 2 patients with late failure, 1 sustained a second dislocation at 3 years after violent trauma during soccer, and was successfully treated by coracoid bone-block; retrospective ISIS score was 2. The other patient sustained dislocation at 8 years secondary to a forced overhead movement and was initially treated by 1 month's immobilization followed by physiotherapy. He showed persistent apprehension and slight discomfort, but did not request revision surgery. ISIS score was 3. Both these patients had resumed sport at their previous level without problems before recurrence and, at last follow-up, both were fully satisfied with the primary surgery.

Surgical techniques and data on arthroscopic Bankart repair have progressed since the present study was performed. Resorbable suture anchorage is no longer used, and the recommended number of anchors has been revised in favor of 3. Recurrence risk assessment has also been greatly improved by the development of the ISIS score, applied retrospectively in the present study.

In the present series, ISIS score did not correlate with recurrence. The patients with early recurrence all had ISIS scores greater than 3, now known to be predictive of recurrence after simple Bankart repair. The same did not hold for late recurrence, where ISIS scores were respectively 2 and 3. The interest of the retrospective calculation of ISIS score lay in the 9 patients scoring >3, only 3 of whom (33%) had true recurrent dislocation, the other 6 (66%) showing no recurrence. It is also noteworthy that the 2 patients with sensation of instability scored respectively 1 and 2.

Interpretation of the present findings is debatable, as sample size was small and there was no randomization against a classical non-operative control group. Follow-up, on the other hand, was long, at around 10 years, with a high satisfaction rate, even in the 2 cases of late recurrence.

No recurrence risk factors emerged, whether primary lesion or chronic lesions, except for the epileptic patient who suffered early recurrence. That no risk factors emerged is again related to small sample size.

The first studies of early Bankart repair concerned an American cohort of military cadets reported by De Bernardino et al. [23], with a recurrence rate of 12% in 49 patients at 5 years. Long-term outcome in the same population was reported by Owens et al. [14], at 10 years follow-up, with 14% recurrent dislocation and 21% subluxation. However, the intense physical activity and trauma exposure of this particular population is not comparable to the present series. Arciero et al. [2] reported 80% recurrence after classical non-operative treatment versus 14% after early stabilization in under-20 year-old athletes at 32 months’ follow-up. Kirkley et al. [11] reporting two follow-ups, at 2 and 5 years, found a significant difference in recurrence after early stabilization versus non-operative treatment: respectively, 16% and 45% at 2 years; 5-year follow-up of the same cohort found significantly increased recurrence in both groups; respectively 27% and 60%. The present study likewise found increased recurrence risk over time, with 2 late dislocations at 3 and 8 years in patients who had resumed all activities without previous problem.

Robinson et al. [13] compared recurrence of dislocation in 2 cohorts of 42 patients with mean age less than 35 years: arthroscopic lavage, versus Bankart repair. Recurrence was significantly less frequent in the latter group (14% vs. 38%), satisfaction was significantly better, and return to activity faster.

Table 3 presents the literature data.

The present results were similar to the literature: 20% recurrence at 2 years, rising to 35% at 10 years after 2 late dislocations.

Crall et al. [24] further demonstrated global economic benefit and improved quality of life in under-25-year-old operated on after initial dislocation, and in all age-groups after first recurrence.

The present series showed significant internal rotation deficit of at least 1 vertebral level compared to the contralateral shoulder, which had in no cases undergone surgery. Small sample size prevented analyzing the role of reininsertion in this stiffness.

Radiology found 3 cases of Samilson 1 centered osteoarthrosis; the lack of a non-operative control group prevented analysis of the cause of this arthropathy. A review of the literature [25] identified both instability and reininsertion as risk factors for medium-term arthropathy.

5. Conclusion

Early surgical treatment by capsule-labrum reinforcement on the Bankart technique within 1 month of initial anterior shoulder dislocation in under-25 year-olds was associated with a low 10-year recurrence rate of 35% (dislocation, 25%; subluxation, 10%) compared to reports for non-operative management. At 10 years' follow-up, only 2 patients had undergone surgical revision by coracoid bone-block. Functional outcome was satisfactory, and the rate of Samilson 1 osteoarthrosis, at 15%, was low.

Disclosure of interest

The authors declare that they have no competing interest.

References


