The acute first-time anterior shoulder dislocation (AFASD)
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A prospective arthroscopic study of acute first-time anterior shoulder dislocation in the young.
A 5-year follow-up study

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A prospective arthroscopic study of acute first-time anterior shoulder dislocation in the young. A 5-year follow-up study

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Abstract
A prospective arthroscopic cohort study was conducted on 31 patients with an acute first-time anterior shoulder dislocation (AFASD). The patients were between 16 and 39 years of age. The mean age was 24 years. They had no history of shoulder problems. All patients were evaluated after 1, 2 and 5 years. The Constant score and Rowe score, the recurrence and instability rate were evaluated, as well as patient's satisfaction and sports participation.
We conclude that after a prolonged follow-up an increase in the instability rate in young patients with AFASD may become apparent. The overall instability rate was 55% (17/31) after 5-year follow-up. In patients younger than 18 years the instability rate was 71% (5/7). Age was the only predicting factor in shoulder instability. The mean Rowe score was 87 (67-100, sd.14). Three patients (n=31) had undergone a stabilisation operation after 5-years follow-up. The intra-articular pathology (type of Baker lesion) found at arthroscopy could not predict shoulder instability. We could not find a correlation between sporting activities and shoulder instability. Based on our results it appears unlikely that arthroscopic lavage may reduce redislocation rates after AFASD in the young patient.

Introduction
Anterior shoulder dislocation is the most common dislocation of the human joints with a reported incidence of 1 to 2 percent in the general population.\(^{12,13,21,24,26}\) The prognosis of recurrence after an acute first-time anterior shoulder dislocation (AFASD) in young patients is reported to be between 17 % and 96 %.\(^{4,10,11,15,16,19,23,28,33,36,38,42}\) Age and athletic participation are prognostic factors in recurrence.\(^{10-12,14-16,28,30,33,36}\) An unstable shoulder with a limited range of motion is very disabling for young sportsmen with overhead activities. The best treatment of acute first-time anterior shoulder dislocation (AFASD) in young patients still remains a debatable issue. Some studies describe the arthroscopic evaluation or treatment of AFASD.\(^{1-3,19,25,30,31,38-41}\) However, most have a short follow-up.

The Swedish study of Hovelius is the only published long-term (10-years) follow-up study of patients with AFASD.\(^{16}\) We may regard his study as the "natural history" for patients with AFASD.

We performed a prospective arthroscopic evaluation cohort study of patients with AFASD to determine:
• the incidence of recurrence and instability after 1, 2 and 5 years of follow-up.
• the intra-articular pathology of the shoulder in patients with AFASD.
Furthermore, we tried to answer the question whether intra-articular pathology of the shoulder can predict the recurrence and instability rate in this patient population.
Materials and methods

From January 1991 to July 1994 we treated 105 patients with 107 acute first-time anterior shoulder dislocations (AFASD) in the emergency department of our regional, university-affiliated hospital. Thirty-one patients with AFASD were included in this study. They all met the following inclusion criteria:

1. An acute first-time anterior shoulder dislocation.
2. Age between 15 and 40 years.
3. Dislocations without fractures.
4. Patients without a history of shoulder problems.

All patients gave informed consent. Of the 105 patients, 50 patients were older than 40 years; 7 patients had fractures (5 greater tuberosity - and 2 glenoid fractures); 17 patients didn’t give informed consent. So, 74 patients did not meet the inclusion criteria and were excluded. The mean age at the first-time dislocation was 24 years (16 - 39 years). Sixty-five percent of the patients were 24 years old or younger. Thirty-six percent were 20 years old or younger. There were 27 men and 4 women. The right side was affected in 17 patients and the left in 14. Twenty-seven patients were right handed. The dominant side was dislocated in 19 patients (61%). All patients had a traumatic shoulder dislocation. Seventeen patients dislocated their shoulder during sports activities, 7 at home, 4 during work and 3 in a traffic accident. Twenty-two patients participated regularly in sporting activities. Apparently, soccer was a frequent cause of dislocation: in 7 out of the 22 patients with sporting activities. Shoulder stressing sports were done by 10 of the 22 patients. In all patients the shoulder dislocation was reduced in the emergency department. The reduction method according to Kocher was used in 25 patients, the Stimson method in 3 patients and in the other 3 patients the Hippocrates method and elevation method were used. The average time between dislocation of the shoulder and reduction was 99 minutes (range: 30 - 480 min.). Neurological complications were seen in 6 patients. Three patients had a neuropraxia of the axillary nerve (9.7%). Two patients had a neuropraxia of the ulnar nerve and 1 had temporary pallesthesia of the hand.

Within 10 days after reduction of the dislocation an arthroscopy was performed under general anaesthesia in lateral decubitus position. The joint was lavaged without a pressure device. The intra-articular pathology found at arthroscopy was classified according to Baker.5 (Figure 1.) We only classified the pathology and washed out the haematoma. We did not perform a stabilisation procedure. There were no early complications related to the arthroscopy. All patients were followed for 1, 2 and 5 years. The assessment was performed by (RLTS) according to the Constant score and Rowe score.8,28 Recurrence and instability (recurrence and subluxation) were evaluated, as well as patient’s satisfaction and sports participation.
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Figure 1: Classification according to Baker

Baker I

Baker II

Baker III
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Statistical methods.
Simple cross tabulations are used to quantify the relation between discrete outcome variables (cf. "instability") and various discrete risk factors. The probability of a dichotomous outcome (cf. "instability") is estimated using a logistic regression model. A backward stepwise approach is applied starting with a model containing all risk factors under study ("age", "gender", "dominance" etc.). Non-significant factors are removed from the model. The (additional) effect of the Baker score is estimated by adding the variable "Baker" to the logistic regression model as a covariate and computing its regression coefficient and its significance. The average outcome on the various scoring systems (cf. "Rowe") is estimated in a multivariate analysis of variance incorporating the score as the dependent variable, the patient ID as a random factor and the follow-up period as a covariate. The effect of instability (correct for follow-up period) is estimated by adding the "instability" as a fixed factor to this model. The relative importance of each of the scoring systems is assessed by a discriminant analysis. Using the "instability" as the grouping variable, the various scoring systems were tested in a backward stepwise fashion for their discriminating performance in classifying the patient as stable or unstable at 5 years.

Results

Recurrence / Instability
At 1-year follow-up 1 patient had a recurrence after 7 months, 2 patients had subluxations. The instability rate was 6.4% (2/31). The mean Constant score was 99 (95-100, sd. 1.7) and the mean Rowe score was 98 (67-100, sd. 6.5). At 2-year follow-up we found 6 recurrences and 8 subluxations. Four patients had recurrences and subluxations. On average recurrences occurred at 14 months (7-20 mths) following the first dislocation. Of the 6 patients with recurrences, 3 patients had 1 recurrence, 1 patient had 2 recurrences and 2 patients had 4 recurrences. The instability rate was 32% (10/31).
The mean Constant score was 99 (89-100, sd. 2.6) and the mean Rowe score was 93 (67-100, sd.11) At 5-year follow-up we found 12 recurrences. Thirteen patients had complaints of subluxation. Eight patients had subluxations with one of more recurrences, 5 patients had only subluxations. On average recurrences occurred at 27 months (7-50 mths). There were 3 patients with 1 recurrence, 4 patients with 2 recurrences, 3 patients with 3 recurrences, 1 patient with 4 recurrences and 1 patient with 5 recurrences. The instability rate was 55% (17/31) for the whole group. The mean Constant score was 98 (84-100, sd.3.9). The mean Rowe score was 87 (57-100, sd.14). Three patients (10%) had undergone a stabilisation operation during 5 years of follow-up.
Between 1 and 2-year follow-up 5 patients had a recurrence. Also between 2 and 5-year follow-up we found another 6 patients with recurrences. Two patients with a recurrence within 2-years follow-up did not develop new recurrences after 5-year follow-up. In the group of patients younger than 25 years, 10 out of 21 patients had a recurrence. This is different from the outcome in the group of patients older than 25 years since here only 2 out of 10 patients had a recurrence.

**Age / gender / R-L side**
In our material we observed an overall influence of age with regard to the recurrence and instability rate. The instability rate in patients older than 25 after 1, 2, 5 years of follow-up was: 0, 10%, and 30% respectively. In patients younger than 25 the instability rate was 10%, 43%, and 67% respectively.

Five of the 7 patients (71%) younger than 18 years had shoulder instability after 5 years. Of the 8 patients older than 27 only 3 had this instability. Apparently, there is a lower risk of instability with increasing age. (Table 1.) Seventy-five percent of the women and 52% of the men had instability after 5 years. The relative risk in women with regard to instability is 1.4. However, we should realise that since only 4 women were entered into the study, it follows that instability in one of the women would inevitable change the outcome of the entire group with 25%! There was no difference in instability rate between right and left side.

The dominant side showed a higher instability rate (59%) versus non dominant side (25%). However, this non-dominant group is also small (4).

**Table 1. Age versus instability rate**

<table>
<thead>
<tr>
<th>Age (x)</th>
<th>Instability rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>x &lt; 18</td>
<td>5/7 71.4%</td>
</tr>
<tr>
<td>18 &lt; x</td>
<td>5/8 62.5%</td>
</tr>
<tr>
<td>21 &lt; x</td>
<td>4/8 50.0%</td>
</tr>
<tr>
<td>27 &lt; x</td>
<td>3/8 37.5%</td>
</tr>
</tbody>
</table>

**Arthroscopy.**
At arthroscopy we found 19 patients with Baker III lesion, 8 patients with Baker II and 4 patients with Baker I lesion. One patient had an associated SLAP lesion (Superior Labrum from Anterior to Posterior). Seven patients had partial rotator cuff tears and 29 patients had Hill - Sachs lesions. The mean age of patients with Baker III was 24 years (16-38 year), of Baker II 26 years (21-39 year) and Baker I 19 years (16-20 years). There is no correlation between age and type of Baker lesion. In this study we could not find a statistically significant correlation between Baker lesion and instability after 1, 2 and 5-year follow-up. Age was the most important predicting factor in instability.
Constant score / Rowe score

At follow-up the Constant score only changed by an average of 0.5 point each year. In contrast the Rowe score changed by an average of 2.3 points each year. The Constant score decreased by 0.7 points a year in the group with instability. In the group without instability the Constant score remained virtually unchanged during follow-up. This difference in development is statistically significant. The mean Rowe score decreased by 0.5 a year. The mean Rowe score is 19 points higher for the stable versus instable patient population. Only the Rowe score was useful in predicting instability. The mean scores for the group with instability (n=17) after 5-year follow-up are: Rowe score is 77 (sd.11) and the Constant score is 96 (sd. 4.4). The mean scores for the stable group (n=14) are: Rowe score is 99 (sd.3.6) and the Constant score is 99 (sd.2.6). It follows that the Constant score was not a suitable method for assessing instability in our study. There is a clinically relevant and statistically significant correlation between patient satisfaction and the Rowe score. Patients who did not feel confident about their shoulder (n=5) at 5-year follow-up had a mean Rowe score of 66 (sd.7.3). Statistically, this differs significantly from the group of patients who reported to feel confident about their shoulder (n=26). In this group the Rowe score was 91 (sd.11).

Table 2: Recurrence rate, instability rate, Rowe score and Constant score after 1-, 2- and 5- years follow-up.

<table>
<thead>
<tr>
<th></th>
<th>FU 1 n=31</th>
<th>FU 2 n=31</th>
<th>FU 5 n=31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence rate</td>
<td>1</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>3%</td>
<td>19%</td>
<td>39%</td>
</tr>
<tr>
<td>Instability rate</td>
<td>2</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>6,4%</td>
<td>32%</td>
<td>55%</td>
</tr>
<tr>
<td>Rowe score</td>
<td>98</td>
<td>93</td>
<td>87</td>
</tr>
<tr>
<td>Constant score</td>
<td>99</td>
<td>99</td>
<td>98</td>
</tr>
</tbody>
</table>

Sporting activities
In this study 22 patients were active in sports prior to the first shoulder dislocation. At 5-year follow-up 13 patients were still active in sports. (7 still played soccer), only 4 patients participated in shoulder stressing sport. The group with instability (n=17) at 5-year follow-up consists of 4 patients without sporting activities and 13 patients with sporting activities.

Of the group patients (n=9) without active sports participation, 4 patients had instability at 5-year follow-up. There were 2 recurrences in this group. The group of patients with active sports participation (n= 22) had an instability rate of 59% (13/22) and a recurrence rate of 45% (10/22). The mean age of the group with and without sports participation was 23 and
26 years. The patients without shoulder stressing sports had an instability rate of 58% (7/12), the patients with shoulder stressing sports had an instability rate of 60% (6/10). We could not find a statistically significant correlation between sporting activities and instability rate.

**Discussion**

Redislocation of the shoulder is the most frequent complication of the AFASD. Several studies showed that the age of the patient at the time of AFASD is the most important factor in predicting the risk of redislocation.\(^2\)\(^-\)\(^4\)\(^6\)\(^-\)\(^8\)\(^-\)\(^10\)\(^-\)\(^16\)\(^-\)\(^20\)\(^-\)\(^28\)\(^-\)\(^30\)\(^-\)\(^33\)\(^-\)\(^36\)\(^-\)\(^38\)\(^-\)\(^40\)\(^-\)\(^42\) In our study we also found that age was the most important prognostic factor in recurrent shoulder instability. In patients younger than 18 years the instability rate after 5-years of follow-up was 71% (5/7), compared to 55% for the whole group. For many years, the Bankart lesion, an avulsion of the labrum and capsule from the glenoid, was thought to be the “essential lesion” in anterior shoulder instability.\(^6\) It has been reported to be present at the time of surgery in more than 90% of these cases.\(^9\)\(^-\)\(^28\) Baker et al. established a classification system based on arthroscopic findings in a series of 45 patients with AFASD.\(^5\) All patients were younger than 30 years of age. Sixty-two percent had a complete capsule-labral detachment (type III), 25% had a partial labral detachment (type II) and only 6 shoulders (13%) had capsular injuries without labral detachment. Others found in studies of arthroscopic evaluation of AFASD in almost 100% of the cases a Bankart lesion.\(^19\)\(^-\)\(^27\)\(^-\)\(^3\)\(^-\)\(^34\)\(^-\)\(^36\) However, Molé, could not find an uniform pathology in his French prospective multicentre study of patients with AFASD.\(^25\) He concludes that a large variety of lesions associated with AFASD are revealed during arthroscopy. In the present study we confirm these findings. We found the same spectrum of labral pathology with a full rupture of the labrum and capsule (Baker III) in 61% of the cases. In our study we could not find a statistically significant correlation between the Baker lesion and shoulder instability at 5-year follow-up.

A Swedish prospective randomized multicentre study surveyed 30 patients, between 18 and 30 years of age, found a lower rate of redislocation of the shoulder and a better range of motion in a group with arthroscopic lavage compared with a conventionally treated non-operative group.\(^39\)-\(^41\) The recurrence rate at 2-year follow-up was 20% (3/15) in the lavage group, compared with 60% (9/15) in the non-operative group. Similar low rates were reported by Molé and Te Slaa, in short term follow-up studies.\(^25\)\(^-\)\(^34\) Wintzell suggested that arthroscopic lavage had a positive effect on the recurrence rate.\(^40\) However, on the basis of this present study we cannot support his theory. In our study the short follow-up time was the single most important factor in low recurrence and instability rates after 1 and 2-years of follow-up.

In the last years, a few studies, particularly from the group of Wheeler and Arciero, showed a significantly reduced recurrence rate in patients with AFASD who had undergone an arthroscopic stabilisation.\(^1\)\(^-\)\(^4\)\(^9\)\(^30\)\(^31\)\(^38\) They found recurrences in 85% of the non operatively treated patients versus 13% in the surgically treated group. It should be noted that their
group consists of a patient population of highly trained military personnel (cadets from West Point Academy) which is not representative of an ordinary patient population. Secondly, in their studies the groups were not randomized and thirdly, the duration of the follow-up studies was limited to 2 years.\textsuperscript{1,38} Recently, they published their 2-to 5-year follow-up results.\textsuperscript{9} We found also an abstract of the SECEC meeting in Nottingham describing a clinical randomized study of conservative versus operative (open) treatment of AFASD.\textsuperscript{17} At 24 months follow-up the authors found a recurrence rate of 3\% after primary open repair versus 51\% after conservative treatment.\textsuperscript{17}

However, we found only one published prospective randomized clinical trial that compared arthroscopic stabilization with a traditional, non-operatively treated group of patients younger than 30 years. In this study, with a minimum of 24 months follow-up, a statistically significant difference in rate of redislocation was found.\textsuperscript{19} Sixteen percent of the surgically treated patients had a dislocation whereas 47\% of the non-operatively treated patients had a redislocation. There was also a statistically significant difference in disease specific quality of life, in favour of the operated group. They found convincing indications that the overall shoulder function was better in the stabilized group than in the non-operatively treated group.\textsuperscript{18} We agree with their clinical findings that many patients who have never sustained a redislocation of the shoulder might experience functional problems and will lower their work and sports demands because of shoulder instability. Therefore we should not evaluate this patient population merely in terms of recurrence rates, but on the basis of complaints of instability. In addition, we should include an evaluation of subluxations, patients' satisfaction and possible overhead work and sports participation.

In our study we found a clinically relevant and statistically significant correlation between the Rowe score, patient's satisfaction and shoulder instability. We also agree with others that the Constant score is not a sensitive and discriminating score for assessing shoulder instability.\textsuperscript{7-8,41} At 5-year follow-up we found in our study an increasing recurrence and instability rate in patients younger than 40 years with AFASD. In the whole group the recurrence rate increased from 3 to 39\%. Age was the most important predicting factor in shoulder instability. There is a trend that the affected dominant side has a correlation with instability. Gender, R-L side, had no influence on the instability outcome. The overall recurrence rate after 5 years is relatively low compared with most other studies. The reason for this might be twofold: the age of our patient population is up to 40 years and their daily routines are not extremely demanding. In contrast with other published studies we could not support findings that the majority of the recurrences will occur within one year.\textsuperscript{11,32} In our study 50\% of the recurrences occurred after 2-year follow-up.
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We realize that our patient population is small, as is the case with most studies of arthroscopic evaluation, lavage, and treatment. However, all patients have been followed in 1, 2 and 5 year follow-up. To our knowledge, there is no other published study about arthroscopic evaluation of the AFASD with a systematic and complete follow-up of instability of the shoulder and a minimum follow-up of 5-years.

In most studies of AFASD the majority of the patients were active in sports prior to the first traumatic dislocation.\textsuperscript{1-3,19,41} Some studies showed that many patients do not appear to achieve the same sports level as they had prior to AFASD.\textsuperscript{22,30} Whether sporting activities influence the instability rate following AFASD is still an issue of debate. Simonet and Cofield found a clear correlation of sport participation and a higher recurrence rate in young patients with AFASD.\textsuperscript{53} Hovelius and others could not support this theory.\textsuperscript{11,16,20} In the present study we could not find a statistically significant correlation between sporting activities and higher instability rates. The age factor combined with sporting activity plays a major role.

The question remains whether immediate operative treatment will chance high instability rates. Recent studies showed that immediate stabilisation will lower recurrence rates from 80\% to 10 \% after arthroscopic stabilisation.\textsuperscript{1-3,19,22,30,31,38} These studies have the aforementioned disadvantages and have short follow-ups. However, the results of Kirkley’s (randomized) study and our study might be indicative for a trend to a more aggressive approach in order to decrease the instability rate in young patients, as well as improving the overall shoulder function. Further randomized studies are still required to determine the age at which immediate repair is necessary in a general population with AFASD.

We conclude that after a prolonged follow-up an increase in the instability rates in young patients with AFASD may become apparent. The overall instability rate in patients younger than 40 years is 55\% after a 5-year follow-up period. The intra-articular pathology (type of Baker lesion) could not predict shoulder instability. Age was the single most relevant factor in developing shoulder instability. We could not find a correlation between sporting activities and shoulder instability. Based on our results it appears unlikely that arthroscopic lavage reduces redislocation rates after AFASD in the young patient.
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