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Nonoperative Treatment of Primary Anterior Shoulder Dislocation in Patients Forty Years of Age and Younger

A Prospective Twenty-five-Year Follow-up

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Investigation performed at the Department of Orthopedics, Division of Surgery and Perioperative Science, Umeå University Hospital, Umeå, Sweden, as well as at the participating hospitals and clinics

Background: During 1978 and 1979, we initiated a prospective multicenter study to evaluate the results of nonoperative treatment of primary anterior shoulder dislocation. In the current report, we present the outcome after twenty-five years.

Methods: Two hundred and fifty-five patients (257 shoulders) with an age of twelve to forty years who had a primary anterior shoulder dislocation were managed with immobilization (achieved by tying the arm to the torso with use of a bandage) or without immobilization. All 227 living patients (229 shoulders) completed the follow-up questionnaire, and 214 patients completed the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire.

Results: Ninety-nine (43%) of 229 shoulders had not redislocated, and seventeen (7%) redislocated once. Thirty-three recurrent dislocations had become stable over time (14.4%), and eighteen were considered to be still recurrent (7.9%). Sixty-two shoulders (27%) had undergone surgery for the treatment of recurrent instability. Immobilization after the primary dislocation did not change the prognosis. Only two of twenty-four shoulders with a fracture of the greater tuberosity at the time of the primary dislocation redislocated ($p < 0.001$). When shoulders with a fracture of the greater tuberosity were excluded, forty-four (38%) of 115 shoulders in patients who had been twelve to twenty-five years of age at the time of the original dislocation and sixteen (18%) of ninety shoulders in patients who had been twenty-six to forty years of age had undergone surgical stabilization. At twenty-five years, fourteen (23%) of sixty-two shoulders that had undergone surgical stabilization were in patients who subsequently had a contralateral dislocation, compared with seven (7%) of ninety-nine shoulders in patients in whom the index dislocation had been classified as solitary ($p = 0.01$). Gender and athletic activity did not appear to affect the redislocation rate; however, women had worse DASH scores than men did ($p = 0.006$).

Conclusions: After twenty-five years, half of the primary anterior shoulder dislocations that had been treated nonoperatively in patients with an age of twelve to twenty-five years had not recurred or had become stable over time.

Level of Evidence: Prognostic Level I. See Instructions to Authors for a complete description of levels of evidence.

More than seventy years ago, Hermodsson wrote that “The causes of recurrent dislocation of the shoulder have been a puzzle for many centuries.”¹ Since then, many studies have addressed the prognosis of the primary

dislocation²⁻⁶. We learned from the studies by Rowe² and McLaughlin and MacLellan³ that the development of recurrent dislocation was mainly a problem in younger patients. They also described a better prognosis in shoulders that had a

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fracture of the greater tuberosity when the primary dislocation occurred^{2,3}. In his studies, Rowe was unable to prove that immobilization of the primary dislocation changed the prognosis; however, he recommended that treatment^{2,7}, which was also favored in a recent prospective study on primary dislocations in younger patients⁸. The effect of traditional immobilization in internal rotation is doubted by many^{3,9,10} and therefore other treatments have been proposed. Wintzell et al.¹¹ found decreased rates of recurrence after arthroscopic lavage, and Itoi et al.¹² found a decreased rate after immobilization of the arm in external rotation. Despite these efforts to improve the prognosis, redislocation rates following nonoperative treatment have been considered high enough that immediate repair of the primary dislocation has been advocated by some, especially for younger athletic patients^{9,13}.

As suggested by DePalma in 1982, the natural history, responsible etiological factors, associated pathology, prognosis, and treatment still remain unclear¹⁴. As the long-term prognosis of nonoperative treatment of anterior dislocation has not been well documented, the purpose of the present study was to describe the natural history of the condition and to evaluate factors affecting the long-term prognosis for patients, aged forty years or younger, who underwent conservative treatment with or without immobilization during 1978 and 1979¹⁵⁻¹⁹.

Materials and Methods

Clinical Material

In 1977, one of us (L.H.) initiated a prospective study to evaluate the results of nonoperative treatment of primary anterior dislocation of the glenohumeral joint with or without immobilization. The inclusion criteria were (1) an age of forty years or younger, (2) a true primary dislocation that was verified radiographically in an emergency unit, or (3) reduction of the dislocation as performed or verified by an experienced surgeon. All primary dislocations that met these criteria were initially included in the study. No shoulder with a glenoid rim fracture was treated with an acute operation, and these shoulders as well as the shoulders with a nondisplaced fracture of the greater tuberosity (<1 cm) were initially allocated to the two groups of shoulders that received nonoperative treatment. Multidirectional instability²⁰ was an unknown entity in the 1970s, and we diagnosed no shoulders with concomitant rotator-cuff injuries.

Two hundred and thirty-nine shoulders were radiographically evaluated when the primary dislocation occurred, and none of these shoulders had any inflammatory arthropathy. Twenty-seven Swedish hospitals participated in the study. At six larger hospitals, the patients were randomized into two treatment groups. At smaller hospitals, the patients were assigned to treatment either with or without immobilization according to the policy at each hospital. During 1978 and 1979, 261 patients (263 shoulders) were included. However, six patients were excluded during 1980 and 1981; this group included three noncompliant patients with alcoholism, two patients who actually had had recurrent dislocations, and one patient with a posterior dislocation. Consequently, at the end

of 1981, when the two-year follow-up was completed, 255 patients (257 shoulders) were included in the study¹⁶.

Methods and Study Design

One hundred and twelve shoulders were immobilized with the arm tied to the torso for a minimum of twenty-one days to four weeks (Group 1), and 104 shoulders were just placed in a sling until the patient was comfortable (Group 2). Early in the study, a third "mixed-treatment" group (Group 3) was established; this group included forty-one shoulders that for various reasons could not be allocated to Group 1 or 2 or had to be excluded from those treatment groups. Group 3 included thirty shoulders that initially had been treated with immobilization (as in Group 1) but did not complete at least twenty-one days of immobilization because the patient opted to not continue using the immobilization device (twenty shoulders) or because the doctor advised the patient incorrectly (ten shoulders). In two shoulders with a fracture of the greater tuberosity that remained displaced by >1 cm after reduction of the dislocation, open surgery was undertaken just to reduce the tuberosity fracture. Additional reasons for allocation to Group 3 included alcohol abuse (two shoulders), the failure to perform reduction within twenty-four hours (three shoulders), a suspected subluxation prior to dislocation (two shoulders), and epilepsy (two shoulders). In Group 1, sixty-nine patients (62%) were managed with immobilization for twenty-eight days and the others were managed with immobilization for twenty-one to twenty-seven days. In Group 2, thirty-seven patients used the sling for five days or less, fifty used it for about a week, sixteen used it for two weeks, and one used it for three weeks.

Of the original 257 dislocations, 80% were in men. The etiology of the primary dislocation was related to a sports activity in 57% of the shoulders in the two youngest cohorts and 40% of the shoulders in the oldest cohort.

We previously reported on this cohort after follow-up periods of two¹⁶, five¹⁷, and ten¹⁸ years.

Follow-up Assessment

The twenty-five-year follow-up started in the autumn of 2003 for shoulders that dislocated in 1978 and continued during the year 2004 for the patients who had the primary dislocation in 1979.

The twenty-five-year follow-up evaluation consisted of a personal interview for the completion of a twenty-five-year questionnaire. This interview was conducted by letter or telephone or during a follow-up physical and/or radiographic evaluation of both shoulders. All patients were also asked to give their subjective assessment of shoulder function according to the Swedish translation of the Disabilities of the Arm, Shoulder and Hand (DASH) outcome questionnaire^{21,22}.

As many patients had left their original regions and moved to an additional two new regions, two additional doctors (B. Salomonsson, J.N.) performed the follow-up for these shoulders. Twenty-eight patients who were living abroad or were not available for follow-up by the original doctors had the final follow-up performed by one of us (L.H.).

The patients were questioned with regard to the history of pain, function of the shoulder, recurrence of dislocation, dislocation of the contralateral shoulder, and any operative treatment that they had had because of symptoms of glenohumeral instability. The indications for operative intervention varied as the dislocations were treated at many hospitals; however, the decision to operate was always made at the surgeon's discretion on the basis of the patient's subjective assessment of symptoms referable to glenohumeral instability. All operative reports were obtained, but no analysis was done with respect to the number of subluxations or dislocations prior to surgery.

In order to evaluate whether athletic activity at the time-period when the primary dislocation occurred was correlated with the long-term prognosis, we classified the patients into three different cohorts: (1) those who were engaged in contact sports (soccer, bandy [a winter sport that is played on ice with use of a round ball—essentially, field hockey played on ice], and ice hockey), (2) those who participated in other sports, including recreational activities, and (3) those who reported no sport or physical activity, not even recreational activity.

Several categories were established to define the status of the shoulder at the time of the twenty-five-year follow-up evaluation. We used the term *primary dislocation* to describe the initial dislocation of the previously healthy shoulder. If no additional dislocation or subluxation was noted at the time of follow-up, the dislocation was considered to be *solitary*. Solitary dislocations together with shoulders that had just one dislocation or subluxation over the twenty-five years of follow-up were classified as *nonrecurrent*. The term *recurrent dislocation* was used when at least two dislocations and/or subluxations had occurred after the primary event. Shoulders that had had a recurrent dislocation (two or more redislocations) during the first fifteen years after the primary dislocation but had had no additional dislocation or subluxation during the last ten years were considered to have become stable over time (that is, to have *stabilized spontaneously*). The term *subluxation* was used when the patient described a suspected dislocation followed by immediate, spontaneous reduction. At twenty-five years, some of the patients had forgotten what had happened over the years (such as the side of dislocation or recurrences); therefore, these data were also based on the results reported at the two, five, and ten-year follow-up evaluations. Patients who had had a dislocation or subluxation of the contralateral shoulder either before or after the dislocation that had been the reason for inclusion in the present study were characterized as having had bilateral dislocation.

By February 2005, all patients who were alive (including one patient who had been missed at ten years¹⁸) had a follow-up evaluation. Twenty-eight patients had died. The mean duration of follow-up was 25.2 years (range, 24.3 to 26.4 years).

The present report consequently deals with 229 shoulders in 227 patients who completed the twenty-five-year follow-up questionnaire and 214 patients (216 shoulders) who completed the DASH questionnaire. One hundred and seventy-two patients (174 shoulders) also had a physical ex-

amination; however, as many physicians were involved in performing the physical examinations, these data were not consistent and are not reported in this study. Two hundred and twenty-three of 229 shoulders had follow-up radiographs. This analysis will be presented in a later publication.

The analysis of the efficacy of the initial treatment was done for each of the three treatment groups. For other analyses with respect to natural history, all treatment groups were analyzed together.

Statistical Methods

Statistical analyses were performed with use of the chi-square test for differences in proportions among various groups. If any cell contained five subjects or fewer, we used the Fisher exact test. Univariate and multiple logistic regression was used to evaluate effects and to control for possible confounding factors. To demonstrate differences in medians of continuous variables, we used the Kruskal-Wallis test and the Mann-Whitney U test for comparing groups. The level of significance was set at $p < 0.05$.

Results

General Results

During the twenty-five years after the initial dislocation, ninety-nine (43%) of the 229 shoulders had had no additional episodes of dislocation, seventeen shoulders (7%) had had only one recurrence or subluxation, and sixty-two shoulders (27%) had had an operative procedure because of recurrent dislocation. The remaining fifty-one shoulders (22%) were also classified as having a recurrent dislocation or subluxation but had not been treated operatively.

Observations Related to the Long-Term Prognosis

Fracture of the Greater Tuberosity at the Time of the Primary Dislocation

In two of twenty-four shoulders that had a fracture of the greater tuberosity when the primary dislocation occurred, the dislocation recurred during the twenty-five years of observation. Both shoulders were treated operatively with a stabilizing procedure, in one case before and in one case after the ten-year follow-up. Fracture of the greater tuberosity when the primary dislocation occurred was thus associated with a better prognosis with respect to recurrence ($p < 0.001$). Shoulders with a fracture of the tuberosity were excluded in the subsequent analyses.

Recurrence and Initial Treatment

Table I demonstrates the prognosis with respect to two or more recurrences and/or stabilizing surgery in three cohorts, stratified according to age, for the three treatment groups. Immobilization was not associated with the risk of redislocation ($p = 0.705$).

Age and Development of Instability Over Time

At twenty-five years, ten (50%) of twenty shoulders in patients who had been twelve to sixteen years of age at the time of the

TABLE I Results of Treatment with Respect to Recurrence, Surgery Because of Instability, and Age*

	Nonrecurrent (Stable)	Became Stable Over Time	Recurrent	Surgical Treatment	Total
Group 1					
12 to 22 years	14 (33%)	5 (12%)	5 (12%)	19 (44%)	43
23 to 29 years	8 (44%)	3 (17%)	3 (17%)	4 (22%)	18
30 to 40 years	21 (72%)	4 (14%)	1 (3%)	3 (10%)	29
Group 2					
12 to 22 years	9 (25%)	8 (22%)	5 (14%)	14 (39%)	36
23 to 29 years	13 (48%)	5 (19%)	2 (7%)	7 (26%)	27
30 to 40 years	19 (73%)	1 (4%)	1 (4%)	5 (19%)	26
Group 3					
12 to 22 years	3 (23%)	5 (38%)	1 (8%)	4 (31%)	13
23 to 29 years	1 (20%)	1 (20%)	0 (0%)	3 (60%)	5
30 to 40 years	6 (75%)	1 (13%)	0 (0%)	1 (13%)	8

*The values are given as the number of shoulders. Shoulders with a fracture of the greater tuberosity were excluded. When the nonrecurrent shoulders were compared with the others while controlling for age, there was no effect of treatment ($p = 0.705$, multiple logistic regression analysis). Age was a significant factor for recurrence ($p < 0.001$, multiple logistic regression analysis).

initial injury had had operative treatment because of instability (Fig. 1). The corresponding rate was 39% (fifteen of thirty-eight) for patients who had been seventeen to nineteen years old when the primary dislocation occurred, 33% (nineteen of fifty-seven) for patients who had been twenty to twenty-five years old, 26% (seven of twenty-seven) for patients who had been twenty-six to twenty-nine years old, and 14% (nine of sixty-three) for patients who had been thirty to forty years old (Table II, Fig. 1). In total, forty-four (38%) of 115 shoulders in

patients who had been twelve to twenty-five years of age at the time of the original dislocation and sixteen (18%) of ninety shoulders in patients who had been twenty-six to forty years of age had undergone surgical stabilization. The risk of two or more recurrent dislocations in patients who were twenty-three to twenty-nine years old at the time of the original injury was 0.5 in comparison with the risk in those who had been twelve to twenty-two years old. The risk was reduced to 0.15 when patients who had been thirty to forty years old at the time of

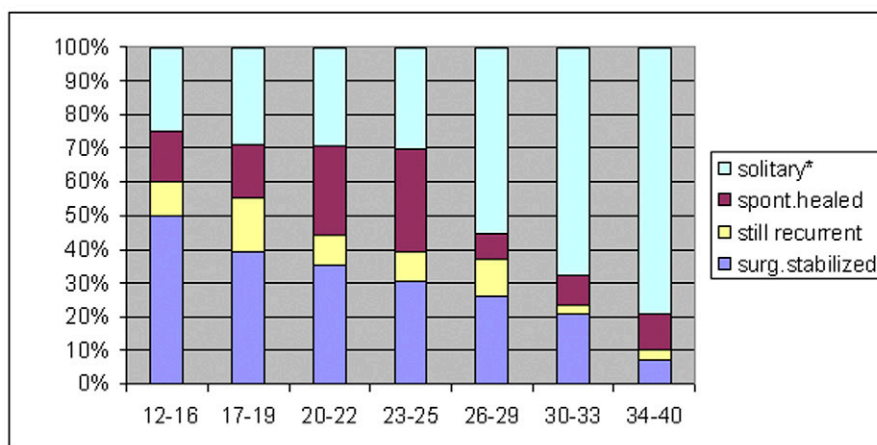


Fig. 1

Histogram showing the percentages of shoulders that had no or only one recurrent dislocation or subluxation, those that had a recurrence leading to operative treatment, those that were classified as still recurrent, and those that had a recurrence but stabilized over time (with no dislocation or subluxation during the last ten years) at the time of the twenty-five-year follow-up evaluation. The data are separated according to the age group of the patient at the time of the original dislocation. Shoulders that had a fracture of the greater tuberosity have been excluded.

*The "solitary" group includes seventeen shoulders with one redislocation.

TABLE II Prognosis at Twenty-five Years in Three Age Groups*

	Age Group			Total
	12 to 22 Years	23 to 29 Years	30 to 40 Years	
Nonrecurrent†	32 (28%) [6]	25 (44%) [3]	59 (73%) [13]	116 [22]
Became stable over time	18 (20%)	9 (18%)	6 (10%)	33
Recurrent	11 (12%)	5 (10%)	2 (3%)	18
Surgical treatment	37 (40%)	15 (28%) [1]	10 (14%) [1]	62 [2]
Total	98 [6]	54 [4]	77 [14]	229 [24]

*The values are given as the number of shoulders. Dislocations recurred twice or more twice as often in patients who had been twelve to twenty-two years old at the time of the primary dislocation as in those who had been twenty-three to twenty-nine years old ($p = 0.06$, univariate logistic regression analysis) and significantly more often than in those who had been thirty to forty years old ($p < 0.001$, univariate logistic regression analysis). The numbers of shoulders with a fracture of the greater tuberosity when the statistics and primary dislocation occurred are shown in brackets; these shoulders were excluded when the percentages were calculated. †The nonrecurrent group included seventeen shoulders with one recurrence or subluxation.

the injury were compared with those who had been twelve to twenty-two years old.

Shoulders That Became Stable with Extended Follow-Up

Fifty-one shoulders had had at least two recurrences or subluxation events during the twenty-five years of observation without being treated surgically. Thirty-three (65%) of these shoulders had no further subluxation or dislocation during the last ten years and, in our opinion, had become stable over time without operative treatment (Tables I and II). These findings have been added to the twenty-five-year follow-up histogram (Fig. 1) in contrast to the ten-year follow-up histogram¹⁸. This also means that, of the 229 shoulders that had twenty-five years of follow-up, thirty-three (14.4%) with several redislocations stabilized spontaneously. These shoulders had the same DASH values as solitary shoulders and shoulders that were surgically stabilized (Fig. 2).

Operative Treatment Because of Recurrent Instability

In sixty-two shoulders (27%), an operative repair had been undertaken because of instability during the twenty-five years of observation. Eight (13%) of these sixty-two shoulders had had an operation since the ten-year follow-up. These eight shoulders were evenly distributed among all age-groups. Moreover, six of the sixty-two shoulders underwent repeat surgery because of a failed instability repair. Except for the repairs that were performed because of instability, no other surgical interventions were performed for any other indication in these or the other patients in the present study.

Athletic Activity and Long-Term Prognosis

Table III demonstrates the outcome for patients engaged in contact sports, other sports, and no sports or recreational activity at all. With the numbers available, no significant difference could be demonstrated with respect to different activity levels and recurrence rates.

Gender

Thirteen (32%) of forty-one shoulders in female patients had been surgically stabilized after twenty-five years, compared with forty-seven (29%) of 164 shoulders in male patients

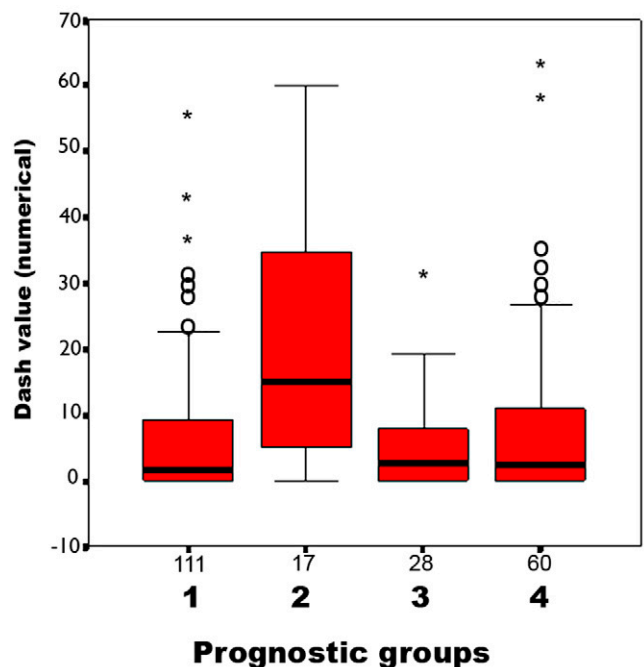


Fig. 2

Distribution of DASH values for shoulders that were classified as non-recurrent (1), still recurrent (2), stabilized over time (3), and surgically stabilized (4). The black lines (in the red rectangles) show the median values. The red rectangles show the interquartile range (the "middle 50%" of the values). The T-bars show maximum and minimum values in the case of no outlying and extreme values. The circles and the asterisks represent outliers and extreme values, respectively, indicating distance from the most frequent values.

TABLE III Prognosis According to Athletic Activity and the Age of the Patient When the Primary Dislocation Occurred*

	Age Group											
	12 to 22 Years				23 to 29 Years				30 to 40 Years			
	Nonrecurrent	Recurrent	Surgically Stabilized	Total	Nonrecurrent	Recurrent	Surgically Stabilized	Total	Nonrecurrent	Recurrent	Surgically Stabilized	Total
Contact sports	13 (30%)	12 (27%)	19 (43%)	44	9 (53%)	3 (18%)	5 (29%)	17	7 (58%)	1 (8%)	4 (33%)	12
Other sports, including recreational activities	10 (34%)	8 (28%)	11 (38%)	29	9 (53%)	6 (35%)	2 (12%)	17	19 (86%)	2 (9%)	1 (5%)	22
No sports	3 (16%)	9 (47%)	7 (37%)	19	4 (25%)	5 (31%)	7 (44%)	16	20 (69%)	5 (17%)	4 (14%)	29
Total	26	29	37	92	22	14	14	50	46	8	9	63

*The risk for recurrence was highest in the group of patients who participated in no sports at all; however, the difference was not significant ($p = 0.151$, multiple logistic regression analysis). Shoulders with fractures of the tuberosity were excluded.

($p = 0.848$). No significant differences with respect to gender and prognosis could be demonstrated, with the numbers available.

Factors without Prognostic Importance

The occurrence of a small fracture of the glenoid rim or an impression fracture of the humeral head (Hermodsson lesion¹, Hill-Sachs lesion²³) at the time of the primary dislocation did not influence the recurrence rate at twenty-five years, with the numbers available.

Dislocation of the Contralateral Shoulder (Bilateral Dislocation)

Twenty-five years after the primary dislocation, thirty-eight patients had had a contralateral dislocation and/or subluxation. The rate was 18% (eighteen of ninety-eight) in the youngest cohort, 24% (thirteen of fifty-four) in the twenty-three to twenty-nine-year-old cohort, and 9% (seven of seventy-seven) in the oldest cohort. Bilateral instability was more common in patients twenty-nine years of age or younger

($p = 0.029$). Fourteen (23%) of the sixty-two shoulders that underwent surgical stabilization were in patients who subsequently had a contralateral dislocation. Seven (7%) of the ninety-nine shoulders in which the index dislocation was classified as solitary were in patients who subsequently had involvement of the contralateral shoulder. This difference between shoulders with solitary dislocations and those requiring surgical repair was significant ($p = 0.009$). When analyzed according to age, this difference remained ($p = 0.036$) (Table IV).

The DASH Outcome Questionnaire

The DASH scores were similar between the shoulders that were classified as nonrecurrent, stable over time, and surgically stabilized; not surprisingly, those with persistent recurrent dislocations (7.9%; eighteen of 229) fared worse compared with the other groups ($p = 0.005$) (Fig. 2). On the average, women scored worse than men (12.8 compared with 7.1; $p = 0.006$). There was no identifiable difference in DASH scores when the dominant and nondominant shoulders were compared (9.0 compared with 7.4; $p = 0.079$).

TABLE IV Distribution of Shoulders with and without Bilateral Involvement According to Age Group and Classification of the Shoulder as Surgically Stabilized or Solitary*

Age-Group	Surgically Stabilized		Solitary	
	Only Index Shoulder Involved	Both Shoulders Involved	Only Index Shoulder Involved	Both Shoulders Involved
12 to 22 years	29	8 (21.6%)	22	3 (12%)
23 to 29 years	11	4 (26.7%)	18	2 (10%)
30 to 40 years	8	2 (20%)	52	2 (3.7%)

*Patients with surgically stabilized shoulders had more bilateral involvement than those with "solitary" shoulders did ($p = 0.009$; chi-square test), including when age was considered ($p = 0.036$; multiple logistic regression). Patients who had been twenty-nine years of age or younger at the time of the primary dislocation had more bilateral involvement than those who had been thirty years of age or older ($p = 0.030$; Fisher exact test).

Discussion

Our earlier finding¹⁶⁻¹⁸, that immobilization with the arm tied to the torso for three to four weeks following a primary shoulder dislocation does not change the prognosis compared with immediate mobilization, was confirmed in this twenty-five-year follow-up study. This finding was supported in the recent study by Robinson et al.⁸. Thus, the present study may represent the true “natural history” of this disorder as no differences could be shown between the two treatment groups. We demonstrated a good outcome (i.e., no recurrence) for 28% of the shoulders in patients who had been twelve to twenty-two years of age at the time of the primary dislocation and 44% of those in patients who had been twenty-three to twenty-nine years of age (Table II). In addition, when shoulders with a fracture of the greater tuberosity were excluded, twenty-seven (19%) of the total number of 142 shoulders and twenty-seven (29%) of ninety-four recurrent or surgically stabilized shoulders had become stable over time in patients who had been twenty-nine years of age or younger at the time of the original dislocation (Table II).

The present study demonstrates that the prognosis for the younger ages is neither very good nor very bad. Using the histogram in Figure 1, the surgeon can give the patient prognostic information about what is likely to happen with the shoulder with respect to recurrent dislocation. We agree with Kirkley et al.²⁴, who stated that most first-time dislocations should be treated nonoperatively. Perhaps future studies will identify factors that support primarily stabilization or nonoperative treatment. The present study did not detect any such factors other than age and fracture of the greater tuberosity; however, that was not our aim when the study was inaugurated.

On the basis of these findings, it is our opinion that routine, immediate surgery for the treatment of all first-time dislocations in patients twenty-five years of age or younger will result in a rate of unnecessary operations of at least 30%, or possibly 50%, if one considers the number of shoulders that became stable over time. At twenty-five years, the total number of shoulders that became stable over time had increased, when compared with the ten-year follow-up, from 49% (twenty-four of forty-nine)¹⁸ to 65% (thirty-three of fifty-one). Furthermore, the time-period without redislocation was longer in the present study (ten years) than in our ten-year follow-up study (five to eight years).

There was a surprisingly high rate of bilateral dislocations (17%; thirty-eight of 229) in this long-term follow-up study. In previous studies, we showed that bilateral involvement was related to younger age^{18,19}. This finding was also confirmed in the present study ($p = 0.029$). In addition, the patients who underwent operative treatment of the shoulder had more bilateral involvement than those who had a solitary dislocation ($p = 0.009$), which supports the notion that constitutional factors such as capsular redundancy, glenoid configuration, or other variations in shoulder anatomy may be of importance and may be involved in determining the prognosis after the primary dislocation.

Athletic activity has⁵ and has not⁶ been considered to increase the risk of recurrence. We did not identify an asso-

ciation. Our classification of contact sports, other sports, and no sports at all can of course be criticized, and a biologic predisposition for shoulder instability may have been responsible for the lack of difference among these subgroups. Our findings that athletic activity was without prognostic value are in concordance with the findings of Robinson et al.⁸.

In the present report and our previous reports, no difference was found between male and female patients with respect to recurrence^{16,19}. This is contrary to the findings of a study of 252 patients with an age of fifteen to thirty-five years who were followed for more than two years, in which female patients had a lower risk of recurrence than did male patients⁸. However, that study had a shorter follow-up period, included only twenty-seven female patients (11%), and included shoulders with a fracture of the greater tuberosity⁸. One explanation for the increased number of female patients in our study is the age limits for patient inclusion, which differed between the two studies. Dislocations are more common in female patients before the age of fifteen years and after the age of thirty-five years¹⁹.

Somewhat surprisingly, there was not a substantial difference between the dominant and nondominant extremities in terms of the DASH score; however, the number of shoulders included in the present study may have been too small to demonstrate a significant difference. Perhaps the DASH is more sensitive for elbow and hand function, and young and middle-aged individuals have a great ability to compensate with respect to activities of daily living. As is the case in association with many other musculoskeletal conditions, women had worse scores than men did.

A strength of the present study was our ability to find all patients after twenty-five years. One explanation for our ability to find all patients is the Swedish system, in which a social security number is obtained at the time of birth and then stays with the person throughout life. With this identifier, one can determine where a person is living. One can also reach relatives and, through them, can contact persons living abroad. On the other hand, the lack of prospective power analysis was a limitation of the present study; however, in 1977, when the present study was planned, this was a rather uncommon demand for most studies. The first publication that we could find on power analysis appeared as late as 1983²⁵, after we had already reported our two-year findings¹⁶. Another limitation is that we used only the DASH self-evaluation score. A recent study⁸ showed that the Western Ontario Shoulder Instability Index (WOSI)²⁶ is more appropriate when dealing with shoulder instability. Again, this knowledge was not so well documented and was unknown to us when we planned the twenty-five-year follow-up in 2002.

The present study can also be criticized because, from the initiation of the study, shoulders with fractures of the greater tuberosity were allocated to Groups 1 and 2 when they should have been allocated to Group 3. Finally, the lack of data from a physical examination at twenty-five years was a limitation of the present study; however, we gave priority to outcome assessment, and we also considered the reporting of

physical findings to be too unreliable because of the many doctors involved in these examinations.

To summarize, half of the shoulders in young patients did not have a recurrent dislocation or became stable over time although they never underwent surgical stabilization. We believe that biologic predisposition and age are important factors to consider with respect to recurrence after primary dislocation of the glenohumeral joint. ■

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