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Incidence of rotator cuff tears in shoulder dislocations and results of therapy in older patients

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Abstract *Introduction:* In older patients we documented the incidence of additional injuries in shoulder dislocations in a non-randomised, prospective study and compared the results of conservative and of operative therapy of rotator cuff tears. *Material and methods:* Between 1993 and 1999 a total of 87 patients were prospectively enrolled. In the case of documented tears of the rotator cuff in combination with symptoms persisting after conservative therapy patients were free to decide between surgical and conservative treatment. Patients were monitored for function, subjective stability, and satisfaction over a minimum follow-up period of 1 year. *Results:* In 54% of the patients enrolled a cuff tear was documented; the frequency increased with advancing age to 100% in patients over the age of 70. Surgical treatment of the cuff tears resulted in better function and satisfaction. There were three recurrences in the conservative treatment group, while no recurrences were documented in surgically treated patients. The significant benefit of cuff repair was confirmed by regression analysis. *Conclusion:* In this selected patient group, we believe surgical repair of the symptomatic rotator cuff tear should be discussed with the patient.

Keywords Rotator cuff · Tear · Older patient

Introduction

Traumatic or recurrent dislocation of the shoulder is a common injury in young individuals, but not as frequent in the older patient. Since the 1950s it has been known that the recurrence rate is higher in young than in older patients [7]. Therefore, in young patients treatment is

focused on the prevention of recurrence as a primary complication. In the older patient, the primary problem is not recurrence, but is rather seen in the associated and often complex structural injuries [6, 12]. These can lead to major problems, such as pain and functional deficits. The prevalence of rotator cuff tears following traumatic dislocation increases with advancing age [6], although the incidence of pre-existing rotator cuff tears is not known. The different injury patterns are thought to be secondary to the changes in tissue properties that occur with aging [4].

Even now, the management of shoulder dislocations in elderly patients is a subject of controversy. Recommendations vary from predominately conservative treatment [5] to more aggressive surgical protocols [13]. As the optimum treatment has not been defined, patients in our institution were given information on both conservative and surgical methods and both treatment options were offered.

The purpose of this study was to determine injury patterns and medium-term results of the treatment of shoulder dislocations in patients of 40 years and over, with a focus on rotator cuff pathology. The management consisted in both conservative and surgical treatment. The hypothesis was that elder patients suffering from shoulder dislocation and rotator cuff tears have benefits from surgical treatment. The results are used as a basis for discussion on guidelines for treatment.

Materials and methods

From 1993 to 1999, all patients treated for shoulder dislocations were prospectively enrolled in this study at admission. The lower age limit was defined as 40 years. On enrolment, each patient's personal data and history were recorded. In all 87 patients a physical examination was performed, including X-rays in two planes and ultrasonography [15]. In addition, CT scans were performed in 17 patients, and MR tomograms in 48. In 2000–2001 all patients were invited to attend an exami-

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nation or were interviewed by telephone if they were not able to travel or refused a personal examination.

There were 48 male and 39 female patients; their average age was 59 years (range 40.1–86.7) when they were first seen. In 53 of these cases the patients were suffering from a primary traumatic dislocation, while 34 patients reported at least one additional dislocation in their history. Of the 87 patients originally enrolled, 65 (75%) were ultimately evaluated; 16 patients had moved, three patients had refused to participate and three had died (Fig. 1).

All patients with primary dislocation were treated conservatively by immobilisation by means of a sling and physiotherapy for 3 weeks. In patients with primary dislocation and documented cuff tear, if there was no clinical improvement after that time they were informed of the treatment options and were free to decide between conservative and surgical treatment. Surgical treatment was offered to patients suffering from recurrent dislocation and documented cuff pathology. If patients gave their consent, surgical repair was carried out. Additional stabilising procedures were not performed. In this series no major complications related to the surgical therapy were documented. Non-surgical conservative treatment comprising physiotherapy aimed at strengthening the stabilising structures of the shoulder.

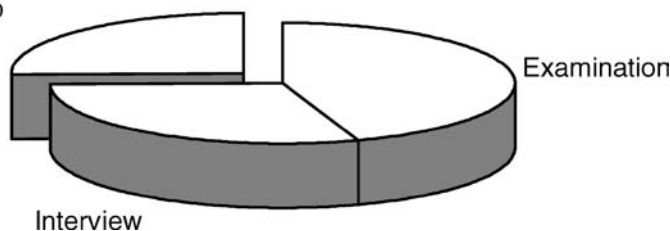
Surgical technique

Patients with proven rotator cuff tears underwent arthroscopic evaluation and arthroscopic subacromial decompression. All patients underwent an open repair through a deltoid-splitting mini-open approach for the rotator cuff tear without detachment of the deltoid from the clavicle or anterior part of the acromion. Partial thickness defects were converted in full-thickness defects and the medially retracted deep fibres were reinserted into the head wherever it was reached with ease with the arm at the side. Thus, a repair was achieved in all cases of this series of patients. Size and shape of the defect were not documented, as procedures were performed in clinical routine. All patients underwent a supervised rehabilitation program postoperatively which comprised passive mobilisation and careful stretching for the first 3 weeks followed by assisted active mobilisation for the next 3 weeks. After this period active exercises were allowed to restore the strength of the internal and external rotators and the deltoid muscle.

Fig. 1 The graph represents the patients included in the study. 75% of the patients enrolled were included in the study

lost for follow

up



Conservative treatment

In cases of non-operative management a supervised rehabilitation program was performed. The program consisted of several steps. First, pain was released by detensioning exercises combined with oral medication. Then, the flexibility and range of motion was restored by stretching exercises. The next step involved restoration of strength of the internal and external rotators against resistance using a rubber tube or weights and improvement of the deltoid strength. After approximately 6 weeks the subsequent steps were aerobic exercises and modification of work and sport activities.

At the end of the study, 39 patients were examined and 26 patients were interviewed by telephone (75%). Both, examination and interview, were standardised and included basic information, which we were able to collect by clinical examination and by telephonic interview in the same way. Conducting researchers were blinded to the type of injury. As the scars were visible, we were not able to blind the investigators to the type of therapy. Both data collections included the same items; a score was used, including pain, mobility, and activity (Fig. 2). The score was adapted to our special study design and based on the Constant score. In addition, numbers of recurrences after treatment, satisfaction with treatment (scored on a scale of 1–5, where 1 = not satisfied and 5 = satisfied), and subjective shoulder stability (scale of 1–5, where 1 = completely unstable and 5 = absolutely stable) were documented.

There were no significant differences between patients interviewed by telephone and those who underwent clinical examination in age (mean 59.04 years SD 12.44 vs. 56.27 years SD 10.21; $P=0.32$), subjective stability of the affected joint (median 3.5 points IR 1.0 vs. 4.0 points IR 2.0; $P=0.08$), score (mean 56.12 points SD 16.25 vs. 61.38 points SD 11.78, $P=0.16$) or the item “subjective satisfaction with treatment” (median 3.0 IR 2.0 vs. 4.0 IR 2.0; $P=0.122$). Thus, the data recorded in both groups were pooled for further analysis in order to allow statistical testing.

Statistical analysis

Mean and standard deviation (SD) were calculated for continuous, median and interquartile ranges for ordinal variables. The paired-samples t test for continuous values and the Mann-Whitney U-test for ordinal values

Fig. 2 Examination (clinical and telephone interview). The data collection sheet includes pain, mobility, and activity. The item muscle strength was excluded, because 26 of 65 patients were interviewed by telephone

Pain:		
none	15 P.	
minimal	10 P	
moderate	5 P.	
strong	0 P.	maximum 15 P.: _____

Grade of activity (pain)

At work	0 (strong)- 4(none)	
At leisure time	0 (strong)- 4(none)	
At night	:0 (strong)-2(none)	maximum 10 P.: _____

Pain during activity of the hands on which level

waist	2 P.	
sternum	4 P.	
neck	6 P.	
head	8 P.	
over head	10P.	maximum 10 P.: _____

Active mobility without pain

0-30° (waist)	2 P.	
31-60°(sternum)	4 P.	
61-90° (neck)	6 P.	
91-120° (head)	8 P.	
121-150° (over head)	10P.	1. flexion _____
		2. abduction _____
		maximum 20 P.: _____

Lateral rotation

hand behind the head/ elbow forwards	2 P.	
hand behind the head / elbow backwards	4 P.	
hand on the head/ elbow forwards	6 P.	
hand on the head / elbow backwards	8 P.	
full extension over the head	10P.	maximum 10 P.: _____

Inner rotation:

Back of the hand lateral to the thigh	0 P.	
Back of the hand at the seat	2 P.	
Back of the hand at a height of sacrum	4 P.	
Back of the hand at a height of L3 (lower lumbar spine)	6 P.	
Back of the hand at a height of Th 12 (lower thoracic spine, chest)	8 P.	
Back of the hand at a height of Th 7 (chest)	10P	maximum 10 P.: _____

were applied in order to determine whether the differences in outcome-parameters were significantly different. Associations between discrete variables were tested by

Cramer's V-test. Ordinal and linear regression analyses were performed to determine which factors were important for the outcomes after adjustment of the po-

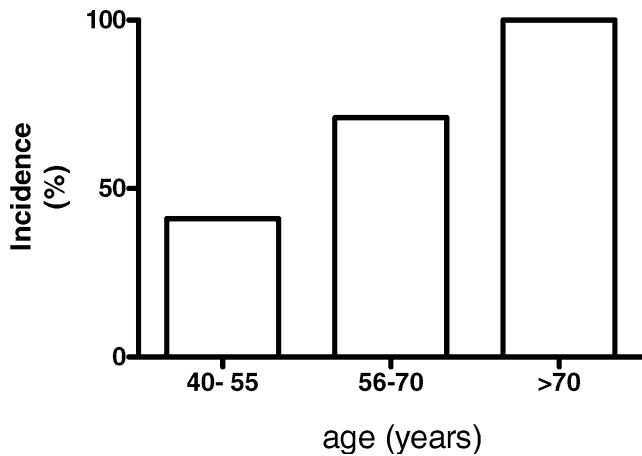


Fig. 3 Incidence of rotator cuff tears in the study population

tential confounders—age and sex. A two-tailed P -value equal to or less than 0.05 was considered significant. Because of the exploratory design of this study we performed all tests without alpha adjustment. Data analysis was performed with SPSS for Windows 10.0.7 (SPSS Inc., USA).

Results

Injury pattern

Anterior dislocation was prevalent in all cases. Clinically there were no major axillary nerve injuries. In 67 patients (77%) a Hill Sachs lesion was found, in 31 (36%) a Bankart lesion, in 14 (16%) a fracture of the greater tuberosity, and in 47 (54%) a full-thickness tear of the rotator cuff. In all cases the tear was of medium to large size (1–5 cm).

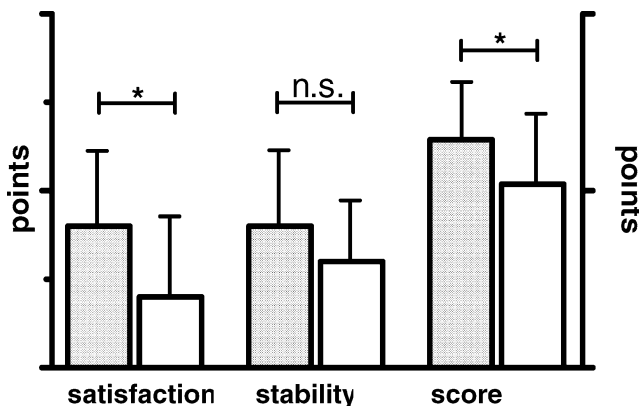


Fig. 4 The graph demonstrates the items satisfaction (median and IR), stability (median and IR), and score (mean and SD). Dotted bars represent values of surgically treated patients, empty bars conservatively treated patients

Outcome in terms of rotator cuff tears

Patients suffering from rotator cuff tears were older than patients with intact cuffs (61.81 years SD 11.73 vs. 51.90, SD 7.91, $P < 0.001^{***}$). The frequency of rotator cuff tears increased with advancing age: in the 40–55 age group the frequency was 41%, in the 56–70 age group 71%, and in those over 70 years of age the frequency was 100% ($P = 0.003^{**}$ for Cramer's V, Fig. 2). For the study group as a whole, there was no statistical significance of lower score values in patients with rotator cuff tears than in patients with intact rotator cuffs (57.67 points, SD 14.27 vs. 61.55 points, SD 11.94, $P = 0.444$).

Regardless of the type of therapy, both groups reported similar levels of satisfaction with the therapy (3.00, IR 2.00 vs. 3.50, IR 1.25, $P = 0.153$), and also similar degrees of subjective stability of the affected shoulder (3.00, IR 1.00 vs. 4.00, IR 1.00, $P = 0.539$). In five cases there was a recurrence after treatment: three of the patients concerned had non-operated rotator cuff tears (3/31 patients, approx. 10%) and two had intact cuffs. In the group of patients suffering from an Hill Sachs lesion there were five recurrences of 46 cases with documented follow-up. No recurrence was found in shoulders with an absent Hill Sachs lesion.

Surgery

There were 33 patients out of 65 with rotator cuff tears among those who were available for the final investigation (51%). In 15 of these patients the tear was operated on, while in the other 18 the tear was treated conservatively. Age did not differ significantly between the patient groups (62.51 years SD 10.93 vs. 56.81 years SD 10.50, $P = 0.139$), but surgically treated patients were significantly more satisfied with their therapy (4.0, IR 2.0 vs. 2.0, IR 2.3; $P = 0.007^{**}$), as demonstrated by significantly higher scores (64.5 points, SD 9.1 vs. 51.9 points, SD 15.5, $P = 0.009^{**}$). Again, there was no significant difference in the parameter “subjective stability” between the groups (4.0, IR 2.0 vs. 3.0, SD 1.0; $P = 0.509$). There were no recurrences in any of the surgically treated patients.

Regression analysis

To describe prospective factors in outcomes, multiple linear and ordinal regression analyses with several combinations of the independent parameters “age”, “gender”, “rotator cuff tear”, and “surgery” referred to subjective stability, score, and subjective satisfaction were performed. Complete data sets were available for 55 patients. After adjustment for age and sex the results were validated. First, regarding the item “subjective stability” there were no significant differences between patients with either intact rotator cuff, or operated rotator cuff tear, or non-operated rotator cuff tear.

Second, after controlling for age and sex the satisfaction of the operated patients was 1.2 points higher compared to all other patients ($P=0.031^*$) and 2.4 points higher compared only to the non-operated patients with rotator cuff tear ($P=0.003^*$). Third, after controlling for age and sex, repair of rotator cuff tears resulted in a significantly better score than was obtained with conservative treatment of a rotator cuff (+11.4 points, $P=0.023^*$). Thus, the better outcome of surgery cannot be explained by a confounding effect of age or sex, but is a genuine benefit of treatment.

Discussion

With increasingly aged populations in the western world, the absolute number of shoulder injuries in older individuals is increasing. In parallel with the aging of our populations, the activity level of older individuals is increasing. These factors together have resulted in an increase in the frequency of trauma and in the necessity for a good functional result when such trauma is treated [3]. This makes it necessary to investigate injury patterns in these patients and to verify our treatment strategies.

In older patients the main problem after dislocation is not the stability but the inferior functional outcome, which is often caused by rotator cuff injuries. These tears result in pain and weakness of the shoulder [9, 16, 17]. McLaughlin [7] explained this finding by a posterior mechanism of the injury. In older individuals the dynamic stabilizers are more likely to fail (rotator cuff), whereas in young individuals it is more often the static restraints that fail (labrum). Additionally, with increasing age the incidence of pre-existing, degenerative tears of the rotator cuff is increasing. In this sense, we are not able to tell degenerative tears from traumatic tears. This fact may partially explain the high incidence of cuff tears in this series and in former studies [6].

At admission tears of the rotator cuff were confirmed in 54% of all the patients in our series. Similar rates were reported by Gumina and Postacchini [3] (61%), Ribbans et al. [14] (61%), and Pevny et al. [13] (35%), but higher rates (100%) were reported by Neviasser et al. [11, 10]. The frequency of rotator cuff tears in asymptomatic individuals increases with age, but the data available do not allow any definitive conclusion as to the exact incidence. Hawkins et al. [4] reported a rate of 8–24% for cuff pathology in cadaver studies, but in ultrasound studies of asymptomatic shoulders an incidence of up to 80% was found in individuals in their eighties and nineties [8]. In our series of symptomatic shoulders the frequency of rotator cuff tears was 100% in patients over 70 years of age.

In general, injuries of the rotator cuff had negative effects on the result of treatment, as demonstrated by regression analysis. Although it has been shown repeatedly in younger individuals that early repair of cuff tears yields better results, there is no agreement about the best

treatment of these injuries in the older patient [2, 5, 10, 11, 13]. As we were not sure whether operative treatment of rotator cuff tears would result in an improved outcome in this specific group, symptomatic patients with confirmed tears and no improvement after initial conservative treatment were given information about operative and conservative treatment and were free to decide between the options. This study design may result in a certain bias, as it may be assumed, that more active and more motivated patients would have opted for the surgical treatment. However, from the ethical point of view we felt there was no justification for recommending one of the potential treatments over the other.

No mass ruptures were documented in this patient group; all tears treated were symptomatic and of medium to large size. In these selected patients operative treatment resulted in a significantly better outcome as reflected in scores and in levels of subjective satisfaction. The parameter “subjective stability” was not affected. Again, this finding indicates that stability is not the major problem in this group. However, it is worthwhile noticing that no recurrences occurred in any of the patients who had surgical treatment for rotator cuff tears, whereas among patients who had cuff tears that were treated conservatively three recurrences were documented.

Only a few studies dealing with this subject are available in the literature. Pevny et al. [13] reported 84% of good results after early repair, as against only 50% after conservative treatment, and concluded that early surgical repair and treatment yielded better results than did conservative treatment of cuff tears. Bassett and Coffield [1] also reported better results after surgical cuff repair in terms of functional outcome and pain relief following acute dislocations. In all studies available, including this study, the cuff repair was combined with an acromioplasty. As this procedure itself may improve the clinical outcome, the documented clinical improvement may be related in part to the acromioplasty. From the study design we are not able to exclude this possible confounder. This fact in combination with the high rate of re-ruptures has to be taken in account when interpreting the results.

With these limitations our data indicate that, in the older patient at least, shoulder dislocation is not a benign injury. This is because of the associated injury of the rotator cuff. When a rotator cuff tear is known to be present and is symptomatic and when short-term conservative treatment does not result in improvement in terms of pain and function, surgical repair should be considered. Further prospective and randomised studies are required to validate the promising results of surgical cuff repair in this patient group.

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