

The pathology of the anterior capsule in patients over forty years of age with recurrent shoulder dislocation

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Abstract

Purpose We evaluated the pathologies of anterior capsular mechanism in older patients with recurrent anterior shoulder dislocation in the absence of full-thickness rotator cuff tears.

Methods Three hundred and ninety-five shoulders with recurrent anterior shoulder dislocation were assessed. The patients were divided into three groups by the age at the first dislocation and the surgical treatment: group A (onset and treatment were at an age over 40 years), group B (onset was at an age under 40 years and treatment was at an age over 40 years) and group C (onset and treatment were at an age under 40 years). Groups A, B and C involved nine, 31 and 355 shoulders, respectively.

Results The prevalence of an isolated Bankart lesion was 81.7 % in group C, 33.3 % in group A and 64.5 % in group B, and each of A and B was significantly lower than group C. The prevalence of an isolated capsular tear was 3.1 % in group C, while it was 33.3 % in group A, which was significantly higher.

Conclusions The prevalence of an isolated Bankart lesion was low and the prevalence of a capsular tear was high in older

patients. We should keep in mind the existence of a capsular tear in older patients and examine the whole anterior capsular mechanism meticulously.

Keywords Recurrent anterior shoulder dislocation · Patients over 40 years of age · Anterior capsular mechanism · Capsular tear · Arthroscopy

Introduction

Recurrent anterior shoulder dislocation was seen commonly in younger patients. Although less frequent, we could also see some older patients with recurrent anterior shoulder dislocation. The majority of published studies have shown that the most common pathology of older patients with recurrent anterior shoulder dislocation was rotator cuff tears. The prevalence of full-thickness rotator cuff tears of the patient with recurrent anterior shoulder dislocation aged over 40 years was from 30 to 90 % [1–4]. Most studies tended to focus on rotator cuff tears as a significant pathology of older patients with recurrent anterior shoulder dislocation. But we should remember that an isolated simple rotator cuff tear cannot cause anterior dislocation and the essential pathology of shoulder dislocations is functional deficiency of the anterior capsular mechanism [5] which provides anterior shoulder stability.

There have been some reports on pathologies of the anterior capsular mechanism in older patients. Some authors reported that a Bankart lesion was observed at the same rate as in younger patients [6, 7], while others reported that midsubstance complete tear of the inferior glenohumeral ligament (capsular tear) or humeral avulsion of the glenohumeral ligament (HAGL lesion) were observed with rotator cuff tears [8, 9]. However, most reports included patients with rotator cuff tears and the details of the pathologies of the anterior

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capsular mechanism without rotator cuff tears have not been elucidated.

Therefore, in this study, in order to eliminate influences of rotator cuff tears, we excluded those patients with full-thickness rotator cuff tears and evaluated the pathologies focusing on the anterior capsular mechanisms in older patients with anterior shoulder instability. The purpose of this study was to assess the characteristics of the pathology of the anterior capsular mechanism in older patients with recurrent anterior shoulder dislocation in the absence of rotator cuff tears.

Materials and methods

Between 2002 and 2007, 400 shoulders with recurrent anterior shoulder dislocation underwent arthroscopic treatment at our institution. Excluding five shoulders with full-thickness rotator cuff tears, 395 shoulders (283 men and 112 women) were the subjects of this study. In order to assess differences of pathologies between older patients with late-onset, older patients with early-onset and younger patients, the patients were divided into three groups by the age at the time of operation and the age at the time of the initial dislocation. A cut-off line of the age for separation was set at 40 years as previously applied in the same kind of studies [2–4, 6, 8]. Group A consisted of patients who experienced the first dislocation at 40 years of age or older and underwent surgical treatment. Group B consisted of patients who experienced the first dislocation under 40 years old and underwent surgical treatment over 40 years old. Group C consisted of patients who experienced the first dislocation under 40 years old and underwent surgical treatment under 40 years old. Groups A, B and C involved nine, 31 and 355 shoulders, respectively (Table 1). The average age at the time of operation was 58.1 (40–72) years in group A, 49.7 (40–64) years in group B and 23.3 (11–39) years in group C. The average age at the time of initial dislocation was 53.6 (40–70) years in group A, 23.1 (9–39) years in group B and 18.6 (9–36) years in group C.

An arthroscopic examination was performed for all patients. We evaluated the pathology of the anterior capsular mechanism and assessed the existence of Bankart lesions,

midsubstance complete capsular tears [10] and HAGL lesions [11]. We defined as a midsubstance complete capsular tear when an interruption of the fibres of the inferior glenohumeral ligament was observed and the muscle belly of the subscapularis was recognised through the interrupted area (Fig. 1) [10]. A HAGL lesion was defined as when the anterior capsular ligamentous complex avulsed from the humeral head and the muscle belly of the subscapularis was recognised through the avulsed area (Fig. 2).

The prevalence of the pathologies of the anterior capsular mechanism was compared between the three groups. We used Fisher's test for statistical analysis and $P < 0.05$ was set as the significance level.

Results

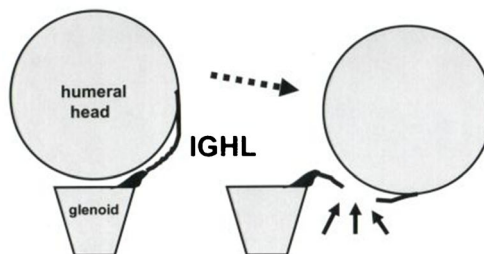
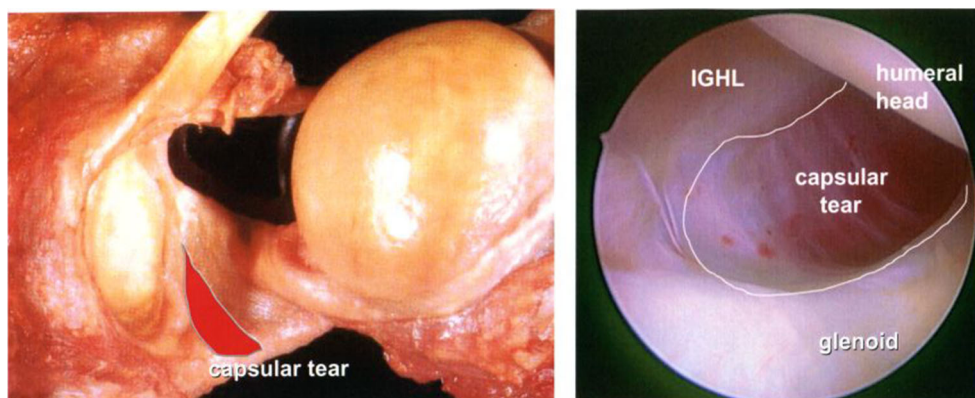
A Bankart lesion was found in five shoulders of group A (55.6 %), in 27 shoulders of group B (87.1 %) and in 337 shoulders of group C (94.9 %). A midsubstance complete capsular tear was found in five shoulders of group A (55.6 %), in nine shoulders of group B (29 %) and in 54 shoulders of group C (15.2 %). A HAGL lesion was found in one shoulder of group A (11.1 %), in 2 shoulders of group B (6.5 %) and in 11 shoulders of group C (3.1 %).

According to the detailed assessment of all pathologies in group A (Fig. 3), an isolated Bankart lesion was found in three shoulders (33.3 %), a Bankart lesion associated with a capsular tear was found in two shoulders (22.2 %), a Bankart lesion associated with a HAGL lesion was not found (0 %), an isolated capsular tear was found in three shoulders (33.3 %) and an isolated HAGL lesion was found in one shoulder (11.1 %). In group B, an isolated Bankart lesion was found in 20 shoulders (64.5 %), a Bankart lesion associated with a capsular tear was found in seven shoulders (22.6 %), a Bankart lesion associated with a HAGL lesion was found in one shoulder (3.2 %), an isolated capsular tear was found in two shoulders (6.5 %) and an isolated HAGL lesion was found in one shoulder (3.2 %). In group C, an isolated Bankart lesion was found in 290 shoulders (81.7 %), a Bankart lesion associated with a capsular tear was found in 43 shoulders (12.1 %), a Bankart

Table 1 Patient profiles

	Group A	Group B	Group C
Onset (years old)	40 and over 40	Under 40	Under 40
Age at operation (years old)	40 and over 40	40 and over 40	Under 40
Number of shoulders	9	31	355
Male to female ratio	1:9	11:20	271:84
Average age at operation (years old)	58.1 (40–72)	49.7 (40–64)	23.3 (11–39)
Average age at the time of first dislocation (years old)	53.6 (40–70)	23.1 (9–39)	18.6 (9–39)
Average duration of symptoms (years)	5.6	26.2	5.3

Fig. 1 Midsubstance complete capsular tear. Interruption of the capsular fibres was observed and the muscle belly of the subscapularis was recognised through the interrupted area. *IGHL* inferior glenohumeral ligament



lesion associated with a HAGL lesion was found in four shoulders (1.1 %), an isolated capsular tear was found in 11 shoulders (3.1 %) and an isolated HAGL lesion was found in seven shoulders (2.0 %).

We compared the prevalence of the pathologies between the three groups. An isolated Bankart lesion was seen in 81.7 % of group C (younger group), while it was seen in 64.5 % of group A and in 33.3 % of group B; both groups A and B were significantly lower ($P=0.0023$ and $P=0.0317$, respectively) than group C. The prevalence of an isolated

capsular tear in the younger group was 3.1 %, while in group B it was 33.3 %, which was significantly higher ($P=0.0033$) (Fig. 4). Other pathologies did not have significant differences between each of the groups.

Discussion

There were some reports on pathologies of the anterior capsular mechanism of recurrent anterior shoulder dislocation in

Fig. 2 HAGL lesion. The anterior capsular ligamentous complex avulsed from the humeral head and the muscle belly of the subscapularis was recognised through the avulsed area. *IGHL* inferior glenohumeral ligament

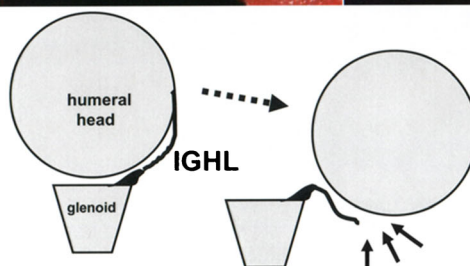
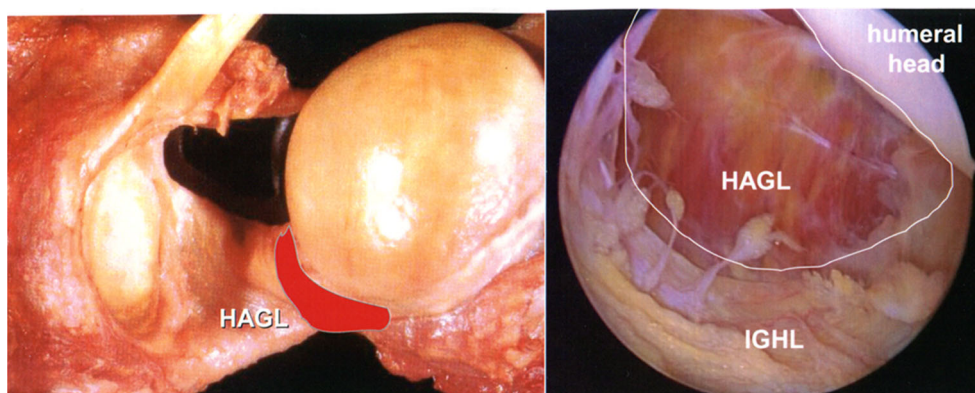
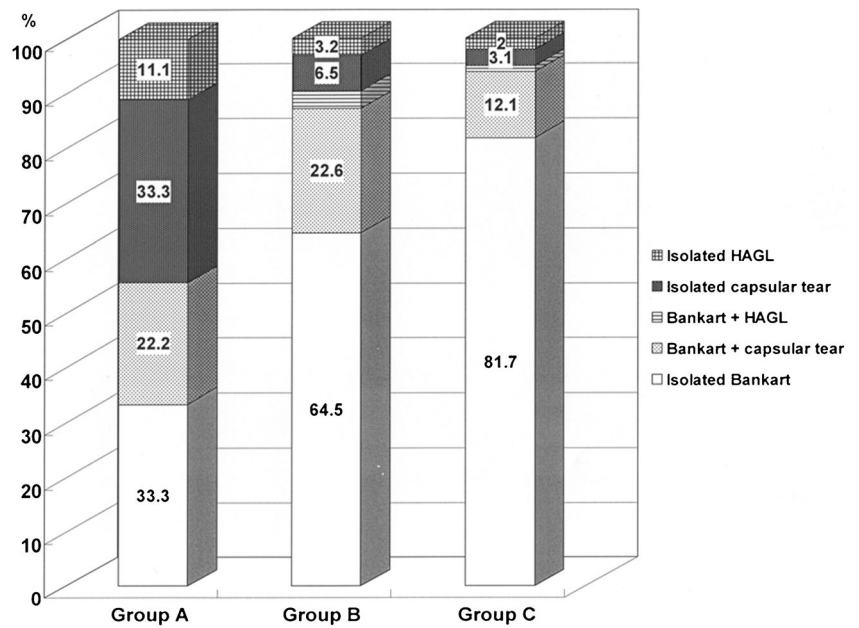


Fig. 3 Total pathologies of each group. The prevalence of isolated Bankart lesions in groups A and B was lower and that of capsular tears in group A was higher than in group C

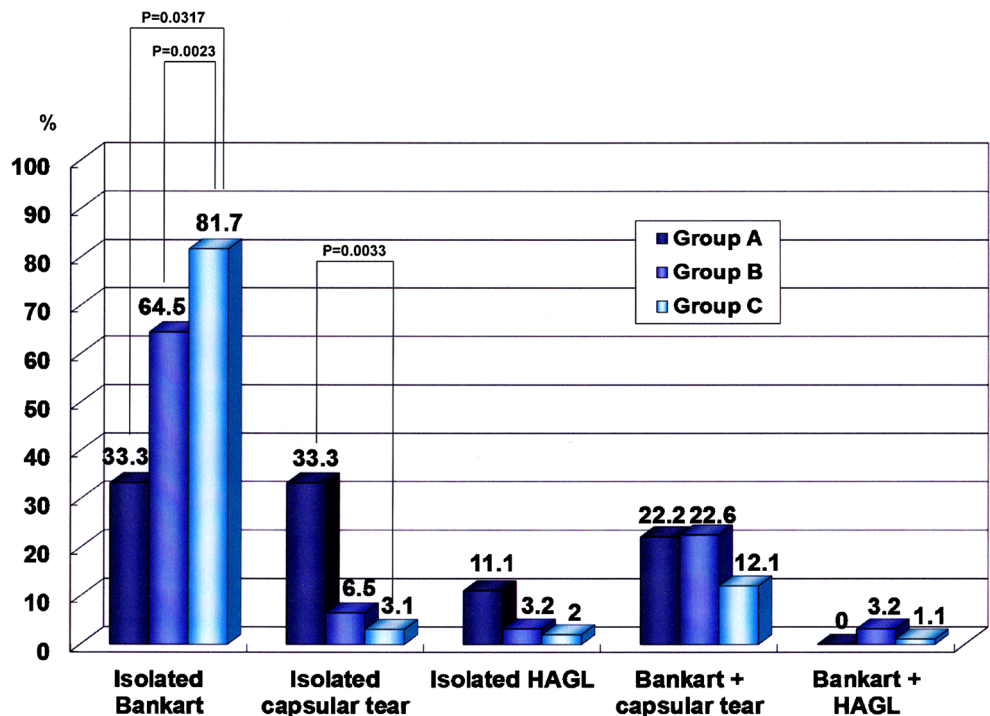


older patients. Araghi et al. investigated 11 shoulders with recurrent anterior shoulder dislocation with onset over 40 years of age. They reported that anterior capsular lesions were observed in all shoulders, and nine of 11 shoulders had anterior capsulolabral detachment, four shoulders had a rotator interval defect, two shoulders had anteroinferior capsular redundancy and one shoulder had a HAGL lesion associated with a small rotator cuff tear [6]. Ikegami et al. reported ten shoulders with recurrent anterior shoulder dislocation in patients aged 50 years or older who underwent surgical treatment. They

stated that the pathology with onset under 50 years of age was Bankart lesions and that with onset over 50 years of age was massive rotator cuff tears associated with Bankart lesions [7]. They concluded that Bankart lesions were mainly observed in young patients.

On the other hand, Neviasser and Neviasser reported on 11 shoulders with recurrent anterior shoulder dislocation with onset over 40 years of age and observed subscapularis tendon tears with avulsion of the anterior capsule from the lesser tuberosity but no Bankart lesion in any shoulders [8].

Fig. 4 Comparison of prevalence of pathologies between the three groups. The prevalence of the shoulders with an isolated Bankart lesion in the younger group was 81.7 %, while in group A it was 64.5 % and in group B it was 33.3 %, which were significantly lower ($P=0.0023$ and $P=0.0317$, respectively). The prevalence of an isolated capsular tear in the younger group was 3.1 %, while in group B it was 33.3 %, which was significantly higher ($P=0.0033$). Other pathologies did not have significant differences between each of the groups



Okamura et al. reported on nine shoulders with recurrent anterior shoulder dislocation with onset over 50 years of age. They stated that severe functional deficit of the anterior stabilising structures such as a tear of both subscapularis tendon and anterior band of the inferior glenohumeral ligament was a characteristic of pathologies in older patients [9]. They concluded that the existence of capsular injury should be remembered as a pathological condition of older patients. All of them also noted that surgical treatment for each lesion of the anterior capsular mechanism was successful. But their studies consisted of a small number of patients including those with rotator cuff tears and the details of the pathologies of the anterior capsular mechanism had not been identified. Therefore, only those patients with recurrent anterior shoulder dislocation without rotator cuff tears were included and examined focusing on the pathologies of the anterior capsular mechanism in this study.

Among younger patients (group C) in this study, the main pathology of recurrent shoulder dislocation was a Bankart lesion, whereas a capsular tear and HAGL lesion rarely occurred. Comparing groups A and C, the prevalence of an isolated Bankart lesion in group A was significantly lower, and that of an isolated capsular tear in group A was significantly higher than in group C. Comparing groups B and C, the prevalence of an isolated Bankart lesion in group B was significantly lower than in group C. The prevalence of a Bankart lesion associated with a capsular tear in group B tended to be higher than in group C, but there was no significant difference.

From these results, we could speculate that in older patients with recurrent anterior shoulder dislocation with onset under 40 years of age such as group B, a Bankart lesion occurred at a young age, and a capsular tear occurred in the period of repetitive dislocations. On the other hand, with regard to recurrent anterior shoulder dislocations developed at over 40 years of age such as group A, we should consider the existence of a capsular tear as a main pathology.

Against this background, the vulnerability of the anterior capsular ligamentous complex due to aging was considered to be the cause of capsular tears. Reeves performed experiments on the tensile strength of the anterior capsular mechanism of the shoulder. He reported that the weakest point was the attachment of the glenoid labrum in the younger subjects, whereas in older people calcification of tissues made the midsubstance of the capsule and subscapular tendon weaker. He supposed that both capsular rupture and subscapularis tendon damage occurred at the time of an acute dislocation in older people [12]. Lee et al. also performed the tensile strength test of the inferior glenohumeral ligament targeting younger and older shoulders. They reported that the inferior glenohumeral ligament tore at the attachment of the

glenoid labrum in the younger shoulders (the average age was 38 years) and tore on midsubstance in the older shoulders (the average age was 83 years), as seen in the report by Reeves. They also noted that the impaired strength of the inferior glenohumeral ligament of the older shoulders was only 46 % of that of the younger shoulders [13].

This study showed that we could speculate there were two types of characteristics in older patients with recurrent shoulder dislocation in the absence of rotator cuff tears. One of them was that those patients with onset under 40 years of age had a Bankart lesion in the early stage and then associated with a capsular tear due to repetitive dislocations during a long period. The other was that those patients with onset over 40 years of age were injured with a capsular tear in the acute stage and then changed over to recurrent shoulder dislocation. From this study, if we treat older patients with recurrent anterior shoulder dislocation in the absence of rotator cuff tears, we should keep in mind the existence of a capsular tear and evaluate the whole anterior capsular mechanism meticulously.

There are several limitations to this study. This was retrospective review and we did not evaluate the pathologies of non-operatively treated patients. The small number of patients and differences of male to female ratios made statistical analysis of data difficult. Furthermore, we did not evaluate the outcome of treatment of these patients [14]. We should do further studies in order to determine if our findings have true clinical relevance.

Conclusions

This study showed that as characteristics of recurrent anterior shoulder dislocation in older patients in the absence of rotator cuff tears, the prevalence of an isolated Bankart lesion was lower and that of isolated and associated capsular tears was higher than those of younger patients. So we should keep in mind the existence of a capsular tear and evaluate the whole anterior capsular mechanism meticulously.

Compliance with ethical standards All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. For this type of study formal consent is not required. This article does not contain any studies with human participants or animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Gumina S, Postacchini F (1997) Anterior dislocation of the shoulder in elderly patients. *J Bone Joint Surg Br* 79:540–543
2. Hawkins RJ, Bell RH, Hawkins RH, Koppert GJ (1986) Anterior dislocation of the shoulder in the older patient. *Clin Orthop* 206: 192–195
3. Penvy T, Hunter RE, Freeman JR (1998) Primary traumatic anterior shoulder dislocation in patients 40 years of age and older. *Arthroscopy* 14:289–294
4. Porcellini G, Paladini P, Campi F, Paqanelli M (2006) Shoulder instability and related rotator cuff tears: arthroscopic findings and treatment in patients aged 40 to 60 years. *Arthroscopy* 22:270–276
5. Kummel BM (1979) Spectrum of lesions of the anterior capsular mechanism of the shoulder. *Am J Sports Med* 7:111–120
6. Araghi A, Prasarn M, St Clair S, Zuckerman JD (2005) Recurrent anterior glenohumeral instability with onset after forty years of age: the role of the anterior mechanism. *Bull Hosp Jt Dis* 62:99–101
7. Ikegami H, Ogawa K, Takahashi M, Inokuchi W (2002) Recurrent anterior dislocation of the shoulder in patients aged 50 and more (in Japanese). *Katakansetsu* 26:283–286
8. Neviasser RJ, Neviasser TJ (1995) Recurrent instability of the shoulder after age 40. *J Shoulder Elbow Surg* 4:416–418
9. Okamura K, Kimura A, Fukushima S et al (1999) Recurrent anterior dislocation of the shoulder with onset after age 50 (in Japanese). *Katakansetsu* 23:453–456
10. Mizuno N, Yoneda M, Hayashida K, Nakagawa S, Mae T, Izawa K (2005) Recurrent anterior shoulder dislocation caused by a midsubstance complete capsular tear. *J Bone Joint Surg Am* 87: 2717–2723
11. Wolf EM, Cheng JC, Dickson K (1995) Humeral avulsion of glenohumeral ligaments as a cause of anterior shoulder instability. *Arthroscopy* 11:600–607
12. Reeves B (1968) Experiments on the tensile strength of the anterior capsular structures of the shoulder in man. *J Bone Joint Surg Br* 50: 858–865
13. Lee TQ, Dettling J, Sandusky MD, McMahon PJ (1999) Age related biomechanical properties of the glenoid-anterior band of the inferior glenohumeral ligament-humerus complex. *Clin Biomech (Bristol, Avon)* 14:471–476
14. Maier M, Geiger EV, Ilius C, Frank J, Marzi I (2009) Midterm results after operatively stabilised shoulder dislocations in elderly patients. *Int Orthop* 33(3):719–723. doi:10.1007/s00264-008-0578-z