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Treatment of Traumatic Anterior Shoulder Dislocation in Patients Older Than 60 Years

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Background: The prevalence of traumatic anterior shoulder dislocation in the elderly population has increased; however, no consensus has been reached regarding the management of shoulder dislocations in elderly patients.

Purpose: This study investigated the clinical manifestations of traumatic anterior shoulder dislocation in patients older than 60 years and evaluated the functional outcomes of different treatment modalities based on associated abnormalities and the number of dislocations.

Study Design: Case series; Level of evidence, 4.

Methods: Sixty-seven patients older than 60 at the time of primary shoulder dislocation were included. Magnetic resonance imaging or ultrasonography was performed on all patients to confirm associated injuries. Fifty-two patients were treated for primary shoulder dislocation and 15 for recurrent dislocation.

Results: Postinjury examinations revealed no associated injuries in 31 patients with primary shoulder dislocation; these patients recovered shoulder function after rehabilitation (American Shoulder and Elbow Surgeons [ASES] score: 93 ± 6 ; Constant score: 89 ± 8). For the other 36 patients, 33 were found to have rotator cuff tears (isolated cuff tears in 16), and 3 were found to have an isolated Bankart lesion. The average ASES score of the 17 patients with primary shoulder dislocation who were treated operatively was 83 ± 10 , and the average Constant score was 78 ± 13 at final follow-up. The average ASES score of patients with recurrent shoulder dislocation was 89 ± 9 , and the average Constant score was 84 ± 13 . No statistically significant differences in functional shoulder outcomes between patients with primary and recurrent dislocation were evident ($P > .05$). However, patients who were treated nonoperatively showed significantly better recovery of shoulder function than patients who were treated operatively regardless of the number of dislocations ($P < .001$). No recurrent shoulder dislocation was observed in any patient during an average follow-up period of 55 months.

Conclusion: The accurate diagnosis of associated injuries after traumatic anterior shoulder dislocation in patients older than 60 is critical for the recovery of shoulder function because more than half of patients had rotator cuff tears or anterior capsulolabral lesions, which may lead to recurrent shoulder dislocation. Satisfactory clinical outcomes without recurrence were obtained after early detection of abnormalities and different treatment modalities based on associated injuries and the number of dislocations experienced.

Keywords: shoulder dislocation; elderly; rotator cuff tears; anterior capsulolabral lesion

The prevalence of traumatic anterior shoulder dislocation in the elderly has increased because of lifestyle changes, active participation in sports, and prolonged life expectancy.⁹ However, traumatic anterior shoulder dislocation injury mechanisms, clinical manifestations, and treatment modalities have been determined with a focus on young patients. Although Rowe¹⁷ reported no difference in the

incidence of traumatic anterior shoulder dislocation in patients older and younger than 45 years, many studies have demonstrated differences in the clinical manifestations and prognosis in elderly patients.^{9,15}

The pathophysiology of anterior shoulder dislocation is known to differ between the young and the elderly because of age-related changes in tissue elasticity. In the young, dislocation occurs because of failure of anterior supporting structures such as the anterior capsulolabral complex, whereas in the elderly it occurs through disruption of posterior supporting structures, particularly the rotator cuff.¹⁰ Although it is well known that posterior structures are vulnerable to damage after anterior shoulder dislocation with advancing age, some studies have reported that the anterior structures may also play a contributory role, especially in elderly patients with recurrent dislocation.¹⁵ Furthermore, recent biomechanical studies of the relationship between shoulder dislocation and rotator cuff tear have revealed that it is unclear whether shoulder dislocation induces

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rotator cuff injury or whether pre-existing and asymptomatic rotator cuff tears induce abnormal shoulder movement, leading to shoulder dislocation with trivial trauma.^{8,15} From the clinical point of view, no consensus has been reached regarding the management of shoulder dislocations in elderly patients, especially in patients with combined injuries such as an anterior capsulolabral lesion with a rotator cuff tear. Therefore, the clinical manifestations and treatment algorithm in shoulder dislocation patients greater than 60 years of age should be considered. Much of the literature regarding clinical outcomes of shoulder dislocation in the elderly included patients older than 40 years.^{3,9,12}

The purpose of this study was to investigate the clinical manifestations of traumatic anterior shoulder dislocation in patients older than 60 and to evaluate the functional outcomes of different treatment modalities based on associated injuries and the number of dislocations.

MATERIALS AND METHODS

Five hundred thirteen patients treated at one institution for traumatic anterior dislocation of the shoulder from 2000 to 2009 were retrospectively reviewed. Patients with a proximal humerus fracture accompanying shoulder dislocation and those who had undergone a previous shoulder operation were excluded. Of these 513 patients, 82 (16%) were older than 60 years at the time of injury; however, 15 of the 82 were lost to follow-up because of a move, death, or refusal to participate in this study. Accordingly, 67 patients who were available for follow-up for more than 2 years constituted the study cohort. The average follow-up period was 55.8 ± 25.5 months (range, 24-115 months). The ages of the patients at the time of first shoulder dislocation ranged from 60 to 89 years (69.7 ± 8.2 years). There were 51 women with a mean age of 68.7 ± 7.1 years and 16 men with a mean age of 71.2 ± 6.6 years. The dominant extremity was involved in 43 patients. Of the 67 patients, 52 were treated for a primary shoulder dislocation, and the remaining 15 (22%; 4 men and 11 women) were treated for recurrent shoulder dislocation. All 15 patients with recurrent dislocations were referred from other institutions because of continuing symptoms in the injured shoulder. The average age of patients with recurrent shoulder dislocations was 64.9 ± 3.8 years (range, 60-72 years). The cause of primary shoulder dislocations varied: 37 fell from a standing height, 8 were involved in motor vehicle accidents, 4 were involved in bicycle accidents, 2 were injured lifting a heavy weight, and 1 slipped while climbing. Mechanism of injury for the recurrent shoulder dislocation included 9 patients who fell from a standing height, 4 who were involved in motor vehicle accidents, 1 who was involved in a bicycle accident, and 1 in whom the cause of injury was unknown. Four patients felt discomfort in the same shoulder before the traumatic event but had not received any treatment.

All patients underwent magnetic resonance imaging (MRI) or ultrasonography after dislocation to evaluate associated injuries and to determine the optimal treatment method. The 15 recurrent dislocation patients referred from elsewhere had unknown postinjury treatment or

evaluation. Patients with a primary shoulder dislocation were immobilized for 2 weeks after closed reduction. After 2 weeks of immobilization, ultrasonography was performed on asymptomatic patients to confirm the absence of any associated injuries in the shoulder joint. If no associated injury was revealed, patients began pendulum and passive range of motion exercises. Strengthening exercises were followed by pain-free restoration of full range of motion. However, patients with continuous pain, inability to move the shoulder, muscular weakness, or manifestations of instability were immobilized for an additional 2 weeks. If the patients showed clinical improvement and no pathological abnormality by ultrasonography after an additional 2 weeks of immobilization, they were allowed to proceed with further rehabilitation. Magnetic resonance imaging was performed on patients who showed no clinical or functional improvement after 4 weeks of immobilization or on those who experienced recurrent dislocation. Extent of fatty infiltration on MRI of rotator cuffs was evaluated using the Goutallier classification if patients had a rotator cuff tear.¹ Surgical treatment was offered to patients with a symptomatic rotator cuff tear or an anterior capsulolabral lesion regardless of combined injuries and recurrent dislocation. A different operative method was applied to patients based on size of the rotator cuff tear, presence of an anterior capsulolabral lesion, and number of dislocations. Functional outcomes were evaluated using American Shoulder and Elbow Surgeons (ASES) scores and Constant shoulder scores. The Student *t* test was used to compare functional outcomes after treatment between patients with primary and recurrent shoulder dislocation in SPSS (version 14.4 16.0, Chicago, Illinois). *P* values of less than .05 were considered significant.

RESULTS

Twenty-seven of 67 patients (40%) recovered shoulder function after nonoperative treatment within an average of 6 weeks after injury. Ultrasonography after 2 weeks of immobilization revealed no associated injuries around the shoulder joint in these patients. The remaining 40 patients underwent MRI, including the 15 patients with recurrent dislocation. Among these 40 patients, one or more injuries were found in 36 patients. The 4 patients who demonstrated no definite injuries on MRI exhibited symptom relief at an average of 2.4 months after injury. The mean ASES score was 93 ± 6 (range, 82-100), and the Constant score averaged 89 ± 8 (range, 80-100) in 31 patients who recovered shoulder function without any associated injuries after nonoperative treatment. On MRI, a rotator cuff tear was found in 33 patients (49%; 16 patients had isolated cuff tears), while 3 patients had an isolated Bankart lesion. Rotator cuff tears were found in 21 of 39 patients in their 60s (54%), 8 of 18 patients in their 70s (44%), and 4 of 10 patients in their 80s (40%). Two patients had temporary axillary nerve palsy at the time of dislocation. A comparison of associated injuries and rotator cuff tear size between patients with primary dislocation and patients with recurrent dislocation is summarized in Table 1.

TABLE 1
Comparison of Associated Injuries and Rotator Cuff Tear Size
Between Patients With Primary Dislocation and Patients With Recurrent Dislocation^a

Associated Injury	Primary Dislocation (n = 21)	Recurrent Dislocation (n = 15)	Total (N = 36)
Isolated rotator cuff tear	12	4	16
Tear size	Small: 2, medium: 5, large: 4, massive: 1	Large: 3, massive: 1	
Isolated Bankart lesion	2	1	3
Combined rotator cuff tear	7	10	17
Tear size	Partial: 1, medium: 3, large: 1, massive: 2	Partial: 1, small: 2, medium: 4, large: 3	
Combined injuries	Bankart lesion: 1, glenoid rim fracture: 1, biceps tendon rupture: 5	Bankart lesion: 7, ALPSA: 1 bony Bankart: 1, biceps tendon rupture: 1, anterior capsule tear: 1	
Axillary nerve palsy	2	0	2

^aALPSA, anterior labral periosteal sleeve avulsion.

Twenty-one of the 36 patients who demonstrated associated injuries around the shoulder joint experienced a primary shoulder dislocation. Nineteen of these 21 patients demonstrated various rotator cuff tear sizes including 1 partial, 2 small, 8 medium, 5 large, and 3 massive tears. Two patients had an isolated Bankart lesion. Twelve of the 19 patients (63%) were found to have an isolated rotator cuff tear, while 7 patients had a rotator cuff tear associated with other injuries: 5 biceps tendon ruptures, 1 Bankart lesion, and 1 engaging Hill-Sachs lesion combined with an anterior glenoid rim fracture. Seventeen of the 19 patients with a rotator cuff tear and primary dislocation had less than grade 2 fatty infiltration, and the remaining 2 patients had grade 3 fatty infiltration. Of the 3 patients with a massive rotator cuff tear, 2 were found to have rotator cuff arthropathy, including subacromial osteophytes with superior migration of the humeral head on plain radiographs after reduction. However, none had experienced previous shoulder pain (Figure 1). Seventeen patients with a primary dislocation underwent surgery. Fifteen patients received a rotator cuff repair (6 with open rotator cuff repair and 8 with arthroscopic repair), including 1 combined with Bankart repair. One patient with rotator cuff arthropathy underwent hemiarthroplasty. One patient had a large Hill-Sachs lesion impacting the anterior glenoid rim and required open reduction and a Latarjet procedure. Two patients with rotator cuff arthropathy and 2 patients with isolated Bankart lesions refused operative treatment. They recovered shoulder function after physical therapy and experienced no recurrent dislocations at final follow-up (ASES score: 87 ± 5 [range, 81-95]; Constant score: 82 ± 6 [range, 75-90]). The average ASES score of the 17 patients with primary shoulder dislocations who were treated operatively was 83 ± 10 (range, 61-100), and their average Constant score was 78 ± 13 (range, 55-100) at final follow-up. No recurrent shoulder dislocations were found in patients with primary dislocations during the follow-up period.

Fifteen patients had a recurrent shoulder dislocation within an average of 4.2 months (range, 1 week to 1 year) after primary traumatic dislocation. The average number

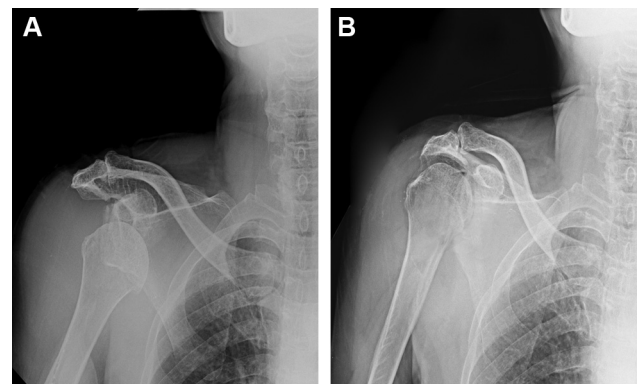


Figure 1. (A) A radiograph of a 68-year-old man with a first dislocation of the right shoulder. (B) After reduction, plain radiography revealed rotator cuff arthropathy with osteophytes under the acromion and superior migration of the humeral head.

of dislocations in patients with a recurrent shoulder dislocation was 3.4 (range, 2-10). Fourteen of these patients had a rotator cuff tear including 4 isolated tears and 10 variously sized tears combined with other injuries (Appendix, available in the online version of this article at <http://ajs.sagepub.com/supplemental/>). Ten patients had anterior capsulolabral lesions including 7 Bankart lesions, 1 bony Bankart lesion, 1 anterior labral periosteal sleeve avulsion (ALPSA) lesion, and 1 anterior capsule tear. All patients with recurrent shoulder dislocations underwent different surgical procedures based on rotator cuff tear size and the presence of an anterior capsulolabral lesion. One patient with a bony Bankart lesion and partial rotator cuff tear and one patient with an isolated Bankart lesion received only a Bankart repair. Six patients with small to medium rotator cuff tears underwent both rotator cuff repair and anterior capsulolabral repair whenever an anterior capsulolabral lesion was present. Seven patients with a large or massive rotator cuff tear underwent only rotator cuff repair regardless of anterior capsulolabral lesions. The average ASES score of patients with recurrent shoulder dislocations

TABLE 2
Comparison of Functional Outcomes Based on
Treatments and Number of Shoulder Dislocation^a

	Primary		Recurrent
	Nonoperative (n = 31) ^b	Operative (n = 17)	Operative (n = 15)
ASES	93 ± 6 ^c	83 ± 10 ^d	89 ± 9
Constant	89 ± 8 ^c	78 ± 13 ^d	84 ± 12

^aValues presented as mean ± standard deviation. ASES, American Shoulder and Elbow Surgeons.

^bFunctional outcomes of patients who had no abnormalities.

^cStatistical differences in shoulder scores between nonoperative treatment and operative treatment regardless of dislocation number.

^dNo statistical differences in functional outcomes between patients with primary and recurrent dislocation after operative treatment.

was 89 ± 9 (range, 75-100), and their average Constant score was 84 ± 12 (range, 73-100) (Table 2). Postoperative complications such as adhesive capsulitis were not found in patients with recurrent dislocation. No recurrent shoulder dislocation was seen in any patient regardless of treatment methods at final follow-up. No statistically significant differences in functional shoulder outcomes between patients with primary and recurrent dislocation after operative treatment were evident at final follow-up (ASES: $P = .119$; Constant score: $P = .218$). However, functional outcomes of injury-free patients who were treated nonoperatively were significantly higher than those of patients who were treated operatively regardless of the number of dislocations (ASES and Constant score: $P < .001$) (Table 2).

DISCUSSION

In the present study, 46% of patients who developed primary anterior shoulder dislocation after 60 years of age had no associated injuries around the shoulder joint and recovered shoulder function after nonoperative treatment. However, 36 of 67 patients had a rotator cuff tear or anterior capsulolabral injuries, which can lead to shoulder instability. Satisfactory clinical outcomes without recurrence were obtained after different treatment modalities. Treatment was chosen based on the size of the rotator cuff tear, the presence of an anterior capsulolabral lesion, and the number of dislocations experienced.

It is important to note that 46% of the patients included in this study did not require surgical intervention and were able to obtain satisfactory clinical outcomes without recurrent dislocation after nonoperative treatment. Patients who were treated nonoperatively showed significantly better recovery of shoulder function than did patients who were treated operatively. Better functional outcomes in patients who underwent nonoperative treatment may be attributed to immobilization immediately after shoulder

dislocation and early diagnosis of associated abnormalities, which can cause further symptoms or recurrences. In this study, patients with primary shoulder dislocation had no instances of recurrence because of early detection and appropriate treatment of associated injuries after the dislocation. Patients referred for recurrent dislocation were not evaluated for additional shoulder injuries before recurrence occurred, even with ultrasonography. Therefore, an accurate diagnosis and proper treatment are critical for shoulder function recovery in elderly patients with primary shoulder dislocation. Various investigations have suggested the timing of accompanying injury evaluations and rehabilitation after primary traumatic anterior shoulder dislocation in elderly patients.^{3,11,13} Sonnabend¹⁹ recommended at least 3 weeks of immobilization after the shoulder reduction of an acute dislocation to allow for an accurate diagnosis. However, Pevny et al¹³ believed that 3 weeks of immobilization is too long in elderly patients and can lead to stiffness of the glenohumeral joint. They recommended that diagnosis of the accompanying rotator cuff tear should be pursued aggressively by MRI 7 to 10 days after reduction if significant pain and weakness are still present. We found that 2 weeks of immobilization was sufficient for pain relief and for restoration of the ability to carry out rehabilitation in half of the patients with primary dislocation. In patients with continuous pain and apparent weakness after 2 weeks of immobilization, shoulder injuries such as rotator cuff tears should be suspected. However, we recommend an additional 2 weeks of immobilization before obtaining further radiographic evaluations in these patients. After 4 weeks of immobilization, the need for further evaluation such as MRI is redetermined by the presence of persistent disabling symptoms. Of the 25 patients who had continuous pain after 2 to 4 weeks of immobilization, 4 were found to have no injuries related to dislocation and recovered shoulder function at an average 2.4 months after injury.

A rotator cuff tear was the most common associated injury after traumatic shoulder dislocation in the elderly. Rates of accompanying rotator cuff tears have been reported to range from 35% to 86% in patients older than 40 with anterior shoulder dislocation.^{2,12,20} In this study, we found that the rate of rotator cuff tear was 49% and that tear size varied considerably. This contradicts the findings of Simank et al,¹⁸ who reported that all rotator cuff tears in their middle-aged patients were confined to medium to large in size. In addition, these authors also reported that the prevalence of rotator cuff tears after traumatic shoulder dislocation increases with age and that all of their patients over 70 years of age with shoulder dislocation had a rotator cuff tear. However, in the present study, rotator cuff tears were present at similar rates by decade after 60 years of age. Although most rotator cuff tears after shoulder dislocation in elderly patients are considered to occur as a result of anterior dislocations, massive rotator cuff tears may also cause facile shoulder dislocation. Biomechanical studies have demonstrated that rotator cuff tears prior to dislocation may induce shoulder movement imbalances by disrupting the balance of forces between the surrounding muscles.^{4,8} In this study, 2 patients were found to have a rotator cuff arthropathy after primary shoulder reduction,

which implies that in essentially asymptomatic patients a massive cuff tear may predispose the patient to shoulder dislocation by trivial injuries.

Although the recurrence rate after primary shoulder dislocation could not be obtained in this study, the recurrence rate of anterior shoulder dislocation in patients older than 60 has been reported to be 11% to 22%.^{2,7} Some evidence has indicated that full-thickness rotator cuff tears in elderly patients disturb the glenohumeral rhythm, resulting in shoulder instability and occasionally recurrent shoulder dislocation.^{5,14} In cadaveric studies, anterior shoulder dislocation has been shown to be affected by rotator cuff tear size.^{4,8} Furthermore, these studies found that when a rupture was located around the rotator interval, a medium-sized rotator cuff tear was capable of producing anterior instability. Seven patients with recurrent dislocation in our series had instability caused only by large or massive rotator cuff tears. These patients with isolated rotator cuff tears achieved satisfactory clinical outcomes without recurrence when rotator cuff repair was the sole operative treatment. Despite damage to the rotator cuff after acute anterior shoulder dislocation in elderly patients, the anterior capsulolabral complex may also contribute to recurrent dislocation. Porcellini et al¹⁵ advocated that rotator cuff injury is a result of recurrent dislocation and considered anterior capsulolabral injuries to be the main pathological disorder in middle-aged patients with recurrent shoulder dislocation. They found that all of their patients who had instability and a rotator cuff tear consistently had associated anterior capsulolabral injuries. An experimental model has also shown that a less extensive capsulolabral injury may lead to dislocation in the apprehension position in the presence of a rotator cuff tear.¹⁶ In our study, 10 of 15 patients with recurrent dislocation had anterior capsulolabral injuries. Therefore, although traumatic anterior shoulder dislocation in the elderly usually occurs because of disturbance of the rotator cuff, we believe that anterior capsulolabral injuries also contribute, particularly in recurrent dislocation patients.

There is room for debate concerning which structures should be repaired in elderly patients with a shoulder dislocation combined with an anterior capsulolabral lesion and rotator cuff tear. Although a small number of patients with an anterior capsulolabral lesion combined with a rotator cuff tear after shoulder dislocation were included in this study, surgical modalities were determined based on cuff tear size and presence of an anterior capsulolabral lesion. In the present study, when a rotator cuff tear was more than a large size, rotator cuff repair alone was performed regardless of the presence of an anterior capsulolabral lesion. Because we believed that a large rotator cuff tear alone can induce glenohumeral joint instability in elderly patients, some surgeons have suggested that the repair of a torn rotator cuff without Bankart repair is sufficient to stabilize the shoulder.^{6,18} On the other hand, when the tear size was smaller than medium, anterior capsulolabral repair was performed as well whenever combined with an anterior capsulolabral lesion. Because the small rotator cuff tear alone is insufficient to induce shoulder instability according to biomechanical studies, anterior capsulolabral lesions appear to play an important role in

glenohumeral joint stability in elderly patients with small or medium rotator cuff tears.⁵ Patients who were treated with different modalities according to rotator cuff tear size and the presence of anterior capsulolabral lesions in this study demonstrated no recurrence regardless of the number of dislocations prior to treatment.

The limitations of this study included the retrospective nature of the analysis and the small number of patients recruited to determine the optimum treatment. Comparison of clinical outcomes and pathomechanics between patients with primary and recurrent dislocation is another limitation because patients with recurrent dislocations were referred from other institutions and their postinjury treatments and evaluations are unknown. Despite satisfactory clinical outcomes after different surgical modalities in this study, we could not prove that these treatment methods were the optimal treatment algorithm because we only utilized one treatment algorithm. A biomechanical study regarding the effect of rotator cuff tear size in combination with anterior capsulolabral injury on anterior shoulder dislocation or a prospective clinical study in a large number of patients is needed to determine the optimal treatment algorithm in elderly patients.

CONCLUSION

The accurate diagnosis of associated injuries after traumatic anterior shoulder dislocation in patients older than 60 years is critical for the recovery of shoulder function because more than half of patients had rotator cuff tears or anterior capsulolabral lesions, which may lead to recurrent shoulder dislocation. Satisfactory clinical outcomes without recurrence were obtained after early detection of injuries and different treatment modalities based on associated injuries and the number of dislocations experienced.

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