

# Management of the First-time Traumatic Anterior Shoulder Dislocation

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Traumatic anterior dislocation of the shoulder is one of the most common directions of instability following a traumatic event. Although the incidence of shoulder dislocation is similar between young and elderly patients, most studies have traditionally focused on young patients due to relatively high rates of recurrent dislocations in this population. However, shoulder dislocations in older patients also require careful evaluation and treatment selection because they can lead to persistent pain and disability due to rotator cuff tears and nerve injuries. This article provides an overview of the nature and pathology of acute primary anterior shoulder dislocation, widely accepted management modalities, and differences in treatment for young and elderly patients.

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**Key Words:** Glenohumeral joint; Shoulder dislocation; Treatment

## Introduction

The glenohumeral joint has the greatest range of motion among all joints in the human body. To achieve increased mobility, joint stability is sacrificed, making shoulder joint susceptible to dislocation. Of the large joints, the glenohumeral joint is the most common for dislocation, with an incidence of 11.2/100,000 per year and an estimated prevalence of 2% to 8% in the general population.<sup>1-3)</sup> Anterior traumatic dislocation is the most common pattern, constituting about 96% of all glenohumeral dislocations.<sup>4)</sup> There is a bimodal distribution of age for the risk of first-time traumatic anterior shoulder dislocation.

A high percentage of patients are men in their second or third decades, who sustain the injury during contact sports, followed by elderly patients who sustain in the jury during low-velocity falls.<sup>5,6)</sup> Regarding the mechanism, dislocation most frequently occurs when the arm is forced into an abducted and externally rotated position. Following a dislocation, primary stabilizers of

the shoulder will invariably be damaged, rendering the joint unstable.

There are controversies over the best treatment for patients with first-time anterior shoulder dislocation. Assessment of risk factors for recurrence is essential when deciding on the treatment options, which can be done through either conservative treatment or surgical stabilization.<sup>6-8)</sup> The length of time and position of immobilization remains controversial in conservative treatment.

Although the incidence of shoulder dislocation is similar between young and elderly patients,<sup>6)</sup> most studies in the literature have traditionally focused on young patients, given the relatively high rate of recurrent dislocations in this population.<sup>9)</sup> However, shoulder dislocations in older patients also require attention. Careful evaluation and treatment selection are crucial in this population because they can lead to persistent pain and disability due to rotator cuff tears and nerve injuries. Hence, this article aims to provide an overview of the nature and pathology

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of acute primary anterior shoulder dislocation, widely accepted management modalities, and difference in treatment for young and elderly patients.

## Pathophysiology

Several studies have reported the pathology of first-time traumatic anterior shoulder dislocation. Due to changes in age-related tissue elasticity, the pathology of anterior shoulder dislocation is also different between young and elderly patients. McLaughlin and MacLellan<sup>10</sup> have described an anterior mechanism of injury in the dislocated shoulder in young patients. In younger patients with strong and healthy rotator cuff tissue, a high-energy insult can result in failure of weaker anterior static restraints (i.e., labrum, capsule).<sup>10</sup> As a consequence, young patients are present with Bankart lesions, which are displaced tears of the anterior-inferior labrum and inferior glenohumeral ligaments. Other lesions that might be associated with traumatic anterior dislocations include superior labral tears from anterior to posterior (SLAP), bony Bankart, anterior labral periosteal sleeve avulsion (ALPSA), humeral avulsion of the glenohumeral ligaments (HAGL) lesion, and rotator cuff tear.<sup>11</sup>

Taylor and Arciero<sup>12</sup> have documented that 97% of their patients have Bankart lesions. Similar findings have been reported in the study of Baker et al.,<sup>13</sup> showing incidence of 87% for Bankart lesions, 64% for Hill-Sachs bony injury, and 18% for capsular tear and rotator cuff injury. Some studies have reported an incidence of 30% for ALPSA,<sup>14</sup> 10% to 24% for SLAP,<sup>13,14</sup> 12% to 13% for bony Bankart,<sup>14,15</sup> and 1% to 6% for HAGL lesion in young patients during first-time dislocation.<sup>13-15</sup>

However, older individuals are at greater risk for rotator cuff injury due to weakened cuff tendons caused by degeneration associated with aging during first-time dislocation compared with younger patients. McLaughlin and MacLellan<sup>10</sup> have suggested a posterior mechanism for such injury in older patients as opposed to an anterior mechanism seen in younger individuals. The rates of accompanying rotator cuff tears have been reported to range from 35% to 86% in patients older than 40 years with anterior shoulder dislocation.<sup>16-20</sup> Shin et al.<sup>21</sup> have reported an incidence of 49% for rotator cuff tears, 7% for Bankart lesions, and 1.5% for Hill-Sachs bony injury in patients older than 60 years with first-time dislocation. Biceps rupture, greater tuberosity fracture, and neurovascular injuries with anterior shoulder dislocations are more common in older patients than in their younger counterparts in addition to cuff tear.<sup>22-24</sup>

In nerve injuries, the axillary nerve is most commonly affected, with a reported incidence of 9.3% to 63.0%,<sup>19,20,24</sup> followed by the suprascapular nerve (29%), musculocutaneous nerve (19%), radial nerve (22%), and ulnar nerve (8%).<sup>24</sup> The increased incidence in older patients might be attributable to age-related degenerative changes in the neural tissue, which render the

nerve more susceptible to injury in closed trauma.<sup>22</sup>

Vascular injury to the axillary artery is an uncommon but well-described sequelae to anterior shoulder dislocation in the elderly.<sup>25</sup> More than 90% of axillary artery injuries resulting from shoulder dislocations occur in patients aged 50 years or over.<sup>26</sup> Proposed mechanisms are aging-related sclerotic changes in the arteries and loss of elasticity that cause tearing rather than stretching of arteries.

## Management for First-time Shoulder Dislocation

### Clinical Assessment

A detailed history and examination are important in the assessment of patients with first-time anterior shoulder dislocation. Assessment should be aimed to establish satisfactory glenohumeral joint reduction, rotator cuff function, neurovascular status, and determination of the presence of a bony Bankart lesion, as these factors can influence early management.<sup>27</sup> A true anteroposterior, scapular Y, and axillary views should be obtained to determine the direction of the dislocation as well as other pathology that may be apparent before any attempt of manipulation and reduction can be made.<sup>28</sup> Post-reduction radiography is also mandatory to confirm a congruent reduction and reassess the position of any associated fractures.<sup>29</sup> If there is any doubt regarding the extent of osseous injury, a 3-dimensional computed tomography (CT) scan should be performed.

Magnetic resonance imaging (MRI) is generally viewed as the gold standard for soft tissue pathology associated with shoulder instability. With MRI, capsular and ligament detachments, labral lesions, rotator cuff tears, and articular cartilage lesions can be identified more accurately than on CT scan or radiography. The addition of intraarticular contrast in an magnetic resonance arthrography identifies labral tears with a sensitivity of 88% to 96% and a specificity of 91% to 98%.<sup>30,31</sup>

However, initial MRI is not typically required to confirm a labral tear in traumatic anterior dislocations because it is known to have a prevalence of nearly 90% in such injuries of young patients. Nevertheless, if pain and instability persist after initial closed reduction and immobilization in patients with higher risk of recurrent instability (e.g., young age, male, contact sports, or shoulder hyperlaxity), MRI should be performed to help better counsel patients regarding the benefit of early shoulder stabilization surgery as an option to decrease the risk of recurrence and associated intra-articular glenohumeral lesions.<sup>32</sup>

Rotator cuff should be thoroughly examined in elderly patients. It can be difficult to diagnose a rotator cuff tear in the initial phase due to pain. Therefore, rotator cuff integrity should be assessed after the reduction of pain through the reduction of dislocation and immobilization within 2 weeks. Either the Jobe test or empty can test is preferred to assess the supraspinatus pa-

thology. The belly press and modified lift off tests are commonly used to assess subscapularis tears.<sup>33</sup> If pain and muscle weakness after a shoulder dislocation is persisted, MRI with arthrography or CT arthrography should be performed.

Finally, a thorough neurovascular examination should be performed, paying special attention to the axillary nerve. Axillary nerve palsy is usually presented as a loss of shoulder abduction and loss of sensation in the proximal-lateral aspect of the arm. The arm is evaluated for brachial plexus injury, which is usually represented as a sensory and/or motor weakness distally in the arm. Although suggestive, these features are not diagnostic in older patients. It is critical to rule out massive rotator cuff tear before diagnosing nerve palsy. For patients with persistent symptoms after shoulder dislocation and with MRI findings that are negative for rotator cuff tear, it is reasonable to obtain electromyography studies to evaluate for nerve palsy.<sup>19,20,24</sup> Vascular injury is assessed by looking for evidence of expanding hematoma, which may indicate arterial/venous injury after recent dislocation. The distal radial and ulnar pulses should be evaluated and compared with those of the contralateral side.

### Duration and Position of Immobilization Following Dislocation

Whether a patient with first-time anterior shoulder dislocation undergoes conservative or surgical treatment, immediate reduction and immobilization are initial recommendations. Reduction should be done carefully to avoid any additional bony or soft tissue injury. Because there is no significant difference in the success of reduction, familiar and skillful reduction techniques can be attempted.<sup>34,35</sup> The initial reduction is usually followed by a period of immobilization, which can be performed for pain control or patient There is also controversy regarding the duration of immobilization following first-time traumatic anterior shoulder dislocation in the literature. A common recommendation is immobilization for 1 to 3 weeks in a sling to allow for early capsular healing, followed by several months of rehabilitation, including range of motion and strengthening exercises.

Kiviluoto et al.<sup>36</sup> performed a study on 226 patients who had first-time traumatic anterior shoulder dislocation with 1-year follow-up. A significant reduction in the rate of recurrence was noted between patients with immobilization for 3 weeks and patients with immobilization for 1 week (23% vs. 50%,  $p < 0.05$ ). They recommended that patients should be immobilized for 3 weeks to a sling for early capsular healing. Simonet and Co-field<sup>37</sup> performed a study on 116 patients who were treated for anterior glenohumeral dislocation for the first time at a mean follow-up of 4.63 years. Recurrence was noted to be significantly more common in younger patients. Patients who were restricted from playing sports for 6 weeks or more had significantly better results than those restricted for less than 6 weeks. Thus, they advised immobilization for 3 to 6 weeks followed by extensive

rehabilitation before returning to athletic activity.<sup>37,38</sup> Conversely, Paterson et al.<sup>35</sup> performed a meta-analysis on patients aged  $< 30$  years who were managed with immobilization in internal rotation for either  $< 1$  week or  $> 3$  weeks. There were no significant differences with respect to the recurrence rate for patients who were immobilized for  $< 1$  week compared with those who were immobilized for  $> 3$  weeks (41% vs. 37%,  $p > 0.05$ ). Hovelius et al.<sup>8</sup> reported that the duration of immobilization did not significantly affect recurrent dislocation or the need for surgery at any time point in any age subgroup.

Although there is no significant evidence currently showing that immobilization decreases the risk of recurrent instability, it is recommended to immobilize patients for 1 to 3 weeks for comfort, particularly in younger athletic population. However, due to the risk of stiffness and frozen shoulder, immobilization should not exceed 2 weeks in middle-age and elderly patients.<sup>36</sup>

Itoi et al.<sup>39</sup> have reported that when the shoulder is immobilized in external rotation, the musculotendinous complex of the subscapularis will become taut, thereby closing the anterior joint cavity and reducing the labrum back to the glenoid rim. They have subsequently hypothesized that external rotation immobilization may improve healing of Bankart lesion in vivo and reduce the rate of recurrent instability due to a more anatomic positioning.<sup>40</sup> In a prospective, multicenter randomized clinical trial, which included 198 patients with a first-time dislocation, the recurrence rate in the external rotation group (26%) was found to be significantly lower than that in the internal rotation group (42%). In the subgroup of patients aged 30 years or younger, the relative risk reduction was 46.1%.<sup>41</sup> According to a recent meta-analysis comparing the position and duration of immobilization after first-time anterior shoulder dislocation, the external rotation immobilization could not reduce the rate of recurrence or improve the quality of life compared with the internal rotation immobilization.<sup>42</sup>

Other authors have found no significant difference in the recurrence rates after immobilization between external and internal rotations in patients with first time shoulder dislocation.<sup>42,43</sup> Further research is required in this area to improve the outcomes after shoulder dislocation.<sup>43</sup>

### Natural History/Risk Factors for Recurrence

Various risk factors at the time of the first episode need to be assessed to establish a treatment protocol. The general consensus in the literature is that young males who are involved in contact sports are at significantly higher risk for recurrent instability than the general population.<sup>11,44</sup> There may be an interaction between sex and other risk factors, such as age or mechanism of injury. For example, young males may be more likely to sustain an instability event during contact sports.<sup>45</sup>

Robinson et al.<sup>7</sup> reported survival analysis predicting the recurrent instability for patients between those who did not play

sports, those who played noncontact sports, and those who played contact or overhead sports. The recurrent instability rates were 73.3%, 62.8%, and 43.9% at the end of 5 years for patients who played contact or overhead sports, noncontact sports, or no sports, respectively. Olds et al.<sup>46)</sup> have suggested that age may be associated with recurrent instability; those under the age of 40 years showed that they may be 13.46 times more likely to suffer from recurrent instability when compared with those over the age of 40 years. They reported a recurrence rate of 51% in patients aged 15 to 20 years, 49% in patients aged 15 to 30 years, 36% in patients aged 21 to 40 years, and 11% in patients older than 40 years.<sup>46)</sup> The recurrence rate of anterior shoulder dislocation in patients older than 60 years has been reported to be between 11% and 22%.<sup>19,47)</sup> This may be due to the differences in biomechanical properties,<sup>48)</sup> collagen fiber type, elasticity of the capsule,<sup>9)</sup> or changes in activity level<sup>49)</sup> as a function of age. Another possibility is the tendency to sustain rotator cuff ruptures in older patients, whereas younger patients tend to tear the anterior stabilizing structures and glenohumeral ligaments.<sup>47)</sup> Hovelius et al.<sup>8,9)</sup> attempted to explain the declining recurrence rate with advancing age on a pathoanatomic basis. They found that the recurrence rate was low when there was an association with tuberosity fracture even in the young. Such fractures are uncommon in younger patients, suggesting that the initial dislocation in young patients disrupts the anterior capsular structures at the glenoid side of the joint, whereas disruption may occur at the humeral side with age. Poor healing in the former impairs the anterior capsular mechanism, predisposing them to recurrence. However there are some older patients who developed instability with multiple recurrent or intractable shoulder dislocations. Levy et al.<sup>47)</sup> have reported that a large or massive rotator cuff tear combined with an anterior capsulolabral injury, which was either a Bankart lesion or fracture of the glenoid rim, caused multiple recurrences due to the disruption of the anterior and the posterior stability mechanisms.

Moreover, those with significant bone defect of the glenoid or humeral head, general ligamentous laxity, and ALPSA lesion are at high risk for recurrence following first-time traumatic anterior shoulder dislocation.<sup>50-58)</sup>

## Conservative versus Surgical Treatment

In patients with first-time traumatic anterior shoulder dislocation, if a fracture requiring rigid fixation, such as greater tuberosity fracture with displacement  $>5$  mm<sup>59)</sup> or glenoid fracture with bone loss  $>20\%$  of the glenoid diameter<sup>51-54)</sup> is not accompanied, the initial treatment should be focused on early closed reduction, immobilization, and physical therapy with the goal to restore motion and strength. Riccio et al.<sup>60)</sup> suggested effective rehabilitative approach as the conservative management in adults with first episode of traumatic anterior shoulder disloca-

tion.

However, some studies have reported that younger patients who are involved in contact or collision sports, or those who require occupationally require the overhead use of the arm, are more likely to have re-dislocation of the shoulder than their less active counterparts or older persons.<sup>11,44)</sup> Sachs et al.<sup>50)</sup> recommended immediate surgical stabilization in young males who practice contact sports with persistent pain or instability, despite a period of initial conservative treatment in the first-time dislocation.

Balke et al.<sup>61)</sup> showed that treatment modalities for first-time shoulder dislocation have significantly changed over the last 10 years in patients aged 30 years or younger and involved in contact sports. Surgical stabilization is preferred to conservative treatment in young males who practice contact sports. Arthroscopic Bankart repair is the main operation compared with open surgery.<sup>11,21,62,63)</sup> Likewise, Kirkley et al.<sup>2)</sup> have suggested that immediate arthroscopic stabilization is the treatment of choice in patients younger than 30 years and in higher-level athletes. Although patients with bone loss  $>20\%$  of the glenoid diameter can still be managed successfully with arthroscopic techniques, instability-related failures are higher in this group.<sup>50)</sup> In cases of attritional bone loss, or when a bony fragment is not suitable for fixation, open glenoid augmentation techniques should be considered.<sup>64)</sup>

Although transient-to-recurrent instability is low in older patients with shoulder dislocation, rotator cuff tear associated with shoulder dislocation shows poor outcome. Some authors have shown better outcomes with surgical management than non-surgical management of rotator cuff tear.<sup>18,65)</sup> An increase in Constant scores has been reported in patients aged between 40 and 60 years, who are treated arthroscopically for rotator cuff tears.<sup>66)</sup> Simank et al.<sup>67)</sup> have reported that repair of a torn rotator cuff without Bankart repair is sufficient in stabilizing the shoulders. However, another study has reported that anterior structures may also play a contributory role, especially in elderly patients with recurrent dislocation.<sup>66)</sup>

Shin et al.<sup>21)</sup> reported that surgical modalities should be determined based on the cuff tear size and whether elderly patients with dislocation have an anterior capsulolabral lesion. They suggested that when a rotator cuff tear is large in size, rotator cuff repair alone may provide sufficient stability regardless of the presence of an anterior capsulolabral lesion. On the other hand, when the tear size is relatively smaller, anterior capsulolabral repair should be performed whenever an anterior capsulolabral lesion is present. Because the small rotator cuff tear alone is insufficient for inducing shoulder instability according to biomechanical studies, anterior capsulolabral lesions appear to play an important role in the glenohumeral joint stability of elderly patients with small-to-medium rotator cuff tears.<sup>68)</sup> Meanwhile, in an elderly patients with intractable shoulder dislocation ac-

accompanied by irreparable massive rotator cuff tear, reverse total shoulder arthroplasty can be considered as an alternative surgical intervention.<sup>69)</sup>

## Conclusion

Whether a patient with first-time traumatic anterior shoulder dislocation undergoes conservative or surgical treatment, immediate reduction and immobilization are initially recommended. Although there is no significant evidence showing that immobilization decreases the risk of recurrent instability, it is recommended to immobilize the patient for 1 to 3 weeks for comfort, particularly for younger, athletic patients. However, in elderly patients, stiffness and frozen shoulder may occur during prolonged immobilization. If persistent pain, instability, or loss of function is observed after immobilization, individual patient evaluation for all factors affecting recurrence is essential to determine the treatment regimen for patients with first-time anterior shoulder dislocation. For the patient population with high risk of recurrent instability (e.g., young age, male, contact sports, or shoulder hyperlaxity), prompt MRI is necessary to make a more accurate diagnosis and to plan the best course of treatment. For older patients with failed nonsurgical treatment, early diagnosis and treatment of the associated rotator cuff tear can lead to satisfactory outcomes.

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