Conservative treatment of first-time shoulder dislocation with the arm in external rotation

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Nonoperative treatment of traumatic first-time shoulder dislocation has remained the same for a long time. Nonoperative treatment of traumatic first-time shoulder dislocation has not changed for a long time. Immobilization in internal rotation after shoulder dislocation has been performed for more than 2000 years, since the era of Hippocrates.23 The recurrence rate after such treatment is unacceptably high, especially in young and active patients.1,20,22 Arthroscopic stabilization is being increasingly recommended after a first-time dislocation.2,5,20,21 Arthroscopic Bankart repair after a first-time dislocation is successful in reducing recurrent instability, with improved instrumentation, implants, surgical techniques, and water pump system.

Some surgeons12,15 suggest that arthroscopic stabilization as a primary intervention has a clear advantage over the use of this technique as a delayed procedure for patients with recurrent instability after a first-time dislocation. They point out that the interval between consultation and surgery can result in further episodes of instability or dislocation, causing further intra-articular damage and jeopardizing the success of the planned procedure. Thus, some surgeons now prefer to choose to do a primary repair in patients with first-time dislocation.

Surgical stabilization after first-time dislocation still remains controversial, however. A study by Hovelius et al7 found that 43% of the patients aged 12 to 40 with a primary anterior shoulder dislocation who had been treated nonoperatively either had not redislocated or had become stable over time. They concluded from these findings that immediate surgery for the treatment of all first-time dislocators aged 25 years or younger would 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. The natural history of 131 first-time dislocators revealed that approximately half had no additional instability event within a 5-year follow-up period, and the other half had 1 or more redislocations.25 These studies warn that...
a recent trend of treatment after first-time dislocation is shifting too much to surgery.

Is nonoperative treatment really effective in preventing recurrent dislocation? It has been clarified that the recurrence rate does not depend on how long the shoulder is immobilized or how securely it is immobilized.\(^2\) All of these data are derived from immobilization in internal rotation. There have been no reports regarding whether internal rotation is the appropriate position for immobilization. Itoi et al\(^9,10\) were the first to study this and discovered the superiority of immobilization in external rotation compared with conventional treatment. This is a revolutionary treatment of first-time dislocation.

Wintzell et al\(^3\) reported that arthroscopic lavage after traumatic primary anterior shoulder dislocation increased the speed of reduction in the pathologic joint effusion compared with the natural course of joint effusion after conventional nonoperative treatment (immobilization in internal rotation). Reduction of joint effusion is believed to allow direct contact between the capsulolabral complex and the glenoid rim, thus promoting healing of the soft tissue lesion.

In this article, we introduce basic studies that are evidence for the development of immobilization in external rotation, recent clinical outcomes reported not only by Itoi et al but also by several investigators, and future tasks. Furthermore, the way to choose the treatment options for first-time dislocations is described.

**Immobilization in external rotation**

Investigational Review Board approval was not required for this review.

**A cadaveric study**

This initial report from Itoi et al\(^10\) demonstrated which immobilization position was suitable for shoulders with first-time dislocation after reduction. First, a simulated Bankart lesion was created in cadaveric shoulders. Linear transducers were attached to the anteroinferior and inferior portions of the Bankart lesion, and the opening and closing of the lesion was recorded with the arm in 0°, 30°, 45°, and 60° of elevation as well as with the arm in rotation from full internal to full external rotation in 10° increments (Fig. 1).

They found with the arm in adduction, the edges of the simulated Bankart lesion were coapted in the range from full internal rotation to 30° of external rotation. A so-called coaptation zone was demonstrated in which the edges of the simulated Bankart lesion were kept approximated. Thus, the shoulder was shown to have potency by itself to reduce a detached labrum laterally onto the glenoid rim by choosing a certain immobilization position.

Miller et al\(^16\) investigated the contact force between the detached labrum and the glenoid in various degrees of rotation. No detectable contact force was found with the arm in internal rotation. The contact force increased as the arm passed through neutral rotation and reached a maximum at 45° of external rotation. The authors concluded that external rotation significantly increased the labrum-glenoid contact force and might influence the healing of a Bankart lesion.

**A magnetic resonance imaging study**

In the previous cadaveric study by Itoi et al\(^10\) all surrounding muscles were removed. However, it was expected that in vivo coaptation might be affected by the surrounding muscles because the muscle tonus changes with the change of arm rotation. Itoi et al\(^11\) hypothesized that the tight anterior soft-tissue structures with the arm in external rotation would push a separated Bankart lesion back to the glenoid. They tested this hypothesis by assessing the position of the Bankart lesion in shoulders with initial or recurrent dislocations using magnetic resonance imaging (MRI) taken with the arm in internal rotation and then in external rotation (Fig. 2).

Separation and displacement of the labrum were both significantly less with the arm in external rotation than in internal rotation. This study demonstrated that immobilization of the arm in external rotation better approximated the Bankart lesion to the glenoid neck than the conventional position of internal rotation.

More recently, Seybold et al\(^29\) evaluated the effect of external rotation on different types of labroligamentous lesions in 34 patients with a first-time dislocation. They
reported that Perthes lesions (detachments of the labrum and capsule from the glenoid in which the anterior scapular periosteum remains intact) and grade I plastic deformations (normal signal intensity in the labroligamentous lesion) showed the best labral reduction on MRI with the arm in external rotation.

Clinical studies by Itoi et al

The previous study using MRI by Itoi et al\(^\text{11}\) showed that the detached soft tissue from the glenoid was better coapted to the glenoid with the arm in external rotation than in internal rotation, suggesting a possible healing of the Bankart lesion with the arm in external rotation. They applied this treatment concept to a small group of patients as a preliminary study.\(^\text{8}\) Patients with a first-time dislocation were assigned to (1) immobilization in internal rotation (20 patients) or (2) immobilization in external rotation (20 patients) for 3 weeks. The recurrence rate was significantly lower with the arm immobilized in external rotation (0%) than in internal rotation (30%) at a mean 15.5 months. This study clinically demonstrated for the first time that immobilization in external rotation was effective in reducing the recurrence rate in patients after a first-time dislocation.

The results of this preliminary study led to a prospective multicenter randomized clinical trial comprising 198 patients with a first-time dislocation\(^\text{7}\) (Fig. 3, A and B). When reviewed at a mean of 2 years, the intention-to-treat...
analysis revealed that the recurrence rate in the external rotation group (26%) was significantly lower than that in the internal rotation group (42%). In the subgroup of patients who were aged 30 years or younger, the relative risk reduction was 46.1%. This study further demonstrated the clinical usefulness of immobilization in external rotation. At least 5 kinds of shoulder external rotation braces are currently commercially available9,30 (Fig. 4).

Other clinical reports

Since Itoi et al8,9 first raised the possibility of improving the outcome of nonoperative treatment after shoulder dislocation, several studies6,27,28 have also shown that immobilization in external rotation is effective in reducing the recurrence rate after a first-time dislocation. However, several opposing articles4,15 have reported that external rotation bracing may not be as effective as previously reported in preventing recurrent anterior shoulder dislocations. Finestone et al4 prospectively studied 51 patients aged between 17 and 27 years to compare a traditional brace in internal rotation and an external rotation brace. At a mean of 33.4 months, 10 from the external rotation group (37%) and 10 from the internal rotation group (41.7%) had sustained a further dislocation, which was not a statistically significant difference.

Future tasks

Previous clinical studies by Itoi et al8,9 revealed that the recurrence rate could be decreased in approximately half with immobilization in external rotation. However, of course, the recurrence rate is not zero and is much larger than that of surgical treatments. We believe that there is still a possibility that the recurrence rate could be further decreased in some way. Three parameters need to be determined: position, period, and indication of immobilization. With regard to the arm position of immobilization in external rotation, an anteriorly displaced Bankart lesion may be reduced posteriorly back to the glenoid by changing the arm rotation. However, because the capsuloligamentous structures are usually displaced anteroinferiorly, the lesion needs to be pushed superiorly as well as posteriorly to achieve the perfect reduction. Hart and Kelly6 observed during arthroscopy that the best reduction was achieved with 30° of abduction and 60° of external rotation. It is likely that adding some degree of abduction in addition to external rotation would improve the reduction of Bankart lesion. Further clinical and basic research studies are needed to evaluate the optimum position of the arm after anterior shoulder dislocation.

The optimum immobilization in external rotation has been investigated, and 3 weeks of immobilization was chosen in the Itoi et al studies.8,9 One current study has examined how different periods of immobilization affect labral coaptation and the final reduction results of the labral lesion. Scheibel et al26 compared 3 vs 5 weeks of immobilization and found that immobilization in 30° of external rotation allowed a similar coaptation of the glenoid labrum both in 3-week and 5-week immobilization groups.

From a biomechanical point of view, the external rotation position is only effective when the detached anterior capsular ligaments are in continuity with the humerus. A midsubstance tear of the capsule or humeral avulsion of a glenohumeral ligament lesion would therefore be a contraindication for immobilization in external rotation, because that would simply result in opening the tear of the capsule without approximating the detached end of the capsular ligament to the glenoid. Immobilization in external rotation would be unable to correct the plastic deformation of the inferior glenohumeral ligament and capsule.18,24,31 This is one of limitations of immobilization in external rotation.

Although recurrence is potentially an important variable to use to measure the success of a treatment, it is not the only measure. The Western Ontario Shoulder Instability Index (WOSI)13 is a patient-evaluated disease-specific quality of life (QOL) scoring system that Kirkley et al14 used to compare the effectiveness of immediate arthroscopic stabilization vs immobilization in internal rotation after a first-time shoulder dislocation. At an average follow-up of 75 months, there was a significant difference between the groups in the WOSI scale but not in the American Shoulder and Elbow Surgeons (ASES) score or the Disabilities of the Arm, Shoulder and Hand (DASH) scale. Patients may still have residual symptoms after surgical or nonsurgical treatment although they have had no recurrent dislocations. To evaluate residual symptoms related to the patient’s disability, QOL assessment tools such as the WOSI may be more sensitive and desirable. Patients’ QOL after surgical or nonsurgical treatment needs to be evaluated for further discussion.
Treatment strategy to prevent recurrent dislocations

As described, the risk of recurrence seems to be reduced approximately by half with immobilization in external rotation. The reported recurrence rates and functional outcomes have consistently and significantly favored surgical stabilization over other treatment, including arthroscopic lavage, in this high-risk population.\(^2,5,20,21\) Immobilization in external rotation is still a useful option when a patient does not want a surgical treatment for various reasons. Patients are able to decide which treatment they want. Patients who decline surgical intervention may choose nonoperative treatment, whereas patients who want to prevent redislocation unfailingly may choose surgery. When explaining the treatment to patients, there is one important point: we need to carefully explain that the treatment duration for healing of a Bankart lesion is the same regardless of the kind of treatment. Even if the patient chooses surgical treatment, the duration to healing cannot be shortened.

There is another treatment option especially for in-season young athletes. They often place significant importance on returning to their sports activity as soon as possible and do not want to waste time waiting for the Bankart lesion to heal. An option for them may be a protective brace that limits the range of abduction and external rotation (apprehension position) to reduce the risk of recurrent dislocation (Fig. 5). The goal of this brace is to let in-season athletes return to their sports without waiting for the lesion to heal. Healing of the Bankart lesion is beyond the scope of this brace application. Surgical stabilization may be necessary during the subsequent off-season if recurrent instability still occurs. Buss et al\(^3\) reported the usefulness of a brace for in-season athletes who had experienced first-time anterior dislocations. In their study of 30 athletes, 26 (87%) were able to return to their sports and complete their seasons, although 37% experienced additional episodes of instability during the season. More recently, Minagawa et al\(^17\) reported a great demand among young athletes for immediate return to sports and completion of the season. Further studies are needed to demonstrate the usefulness of protective brace application.

We thus recommend that clinicians explain the advantages and disadvantages of all treatment options to the patient, and make a decision taking into consideration the evidence of treatment, the patient’s background and request, and the surgeon’s skills and experiences.

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