J Shoulder Elbow Surg (2012) 21, 1588-1592

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Evaluation of dislocation position in patients with recurrent anterior shoulder dislocation

Makoto Tanaka, MD, PhD, Kota Koizumi, MD, Masaaki Kakiuchi, MD, PhD, Kenji Hayashida, MD, PhD*

Department of Orthopaedic Surgery, Osaka Police Hospital, Osaka, Japan

Background: The usual mechanism of anterior shoulder dislocation is widely believed to be a combination of glenohumeral joint abduction, extension, and external rotation forces, even though no published reports to date have investigated the arm position of anterior shoulder dislocation in detail. Understanding the exact position of anterior shoulder dislocations is important for the management of anterior shoulder instability.

Materials and methods: The study included 40 shoulders of 38 patients (32 males, 6 females), aged 28.0 (range, 13-73) years with symptomatic post-traumatic recurrent anterior shoulder instability. While patients were under general anesthesia, but before shoulder-stabilizing surgery, we evaluated the angle of external rotation with 90° elevation in the scapular plane at which the humeral head showed anterior translations over the glenoid rim.

Results: The center of anterior instability at 90° elevation in the scapular plane was at 25.9° of external rotation. Anterior translations were detected in the range of 3.4° of internal rotation to 55.1° of external rotation, and no shoulders (except one) showed anterior translation at maximal external rotation.

Conclusions: Gross anterior translation was seen in the middle range of rotation at approximately 25° of external rotation, and anterior translation decreased close to the end of external and internal rotation. Shoulders with grade III translation showed anterior translation in a wider range of rotation, especially in external rotation. These data will help to further our understanding of the management and the prevention of anterior shoulder dislocations.

Level of evidence: Basic Science Study, Anatomic Study, In Vivo.

Keywords: Dislocation; arm position; examination under anesthesia; range of motion

Anterior shoulder dislocation is widely believed to occur in a shoulder at abduction, extension, and external rotation. Therefore, diagnostic methods, such as anterior apprehension test, crank test, and relocation test, are performed at this position.

The main pathology of anterior dislocation is an insufficiency of the inferior glenohumeral ligament complex (IGHLC), especially the anterior band.[3,10,14,15,17] Because the anterior band of the IGHLC works at maximum abduction, extension, and external rotation,[10,14,15,16] dislocation seems to occur at these positions. However, there are cases where dislocations occur when the shoulder is in a different position.

Investigational Review Board approval was not required for this study. The study involved routine diagnostic test results and data that were recorded in such a manner that human subjects could not be identified.

*Reprint requests: Kenji Hayashida, MD, PhD, Department of Orthopedic Surgery, Osaka Police Hospital, 10-31 Kitayama-cho, Tennouji-ku, Osaka, Japan.

E-mail address: hkenji@leto.eonet.ne.jp (K. Hayashida).

1058-2746/$ - see front matter © 2012 Journal of Shoulder and Elbow Surgery Board of Trustees.
doi:10.1016/j.jse.2011.11.020

Some reports have investigated shoulder instability under anesthesia. However, no study to date has reported an investigation of the rotational angles of the arm abducted in the scapular plane. The humeral head is congruent with the concavity of the glenoid in the scapular plane, and stability is obtained in this position. The evaluation in the scapular plane is suitable for accurate assessment of the soft tissue that contributes to shoulder stability. We believe that it is important to understand the exact position of an anterior shoulder dislocation in an arm abducted in the scapular plane in order to treat anterior shoulder instability for the following reasons:

1. This will be indicative of the position the arm needs to be in to tighten the anteroinferior capsulolabrum complex during surgery and will be helpful to provide an appropriate tension.
2. This position will be one of the indications for biomechanical studies to analyze shoulder instability.

In this study, we investigated the arm position of anterior shoulder dislocations in patients with recurrent shoulder dislocation. Evaluating the translation or laxity is difficult with awake patients because of the patients' protective reaction and overreaction of the dynamic stabilizer. We therefore focused on the static stabilizer by doing the examination with the patient under general anesthesia. We examined anterior translation of the humeral head at each 10° increment from the maximum external rotation to the maximum internal rotation at 90° of abduction in the scapular plane. Only 1 shoulder showed joint instability at maximum external rotation. We found the anterior shoulder instability was recognized at the midrange at approximately 25° of externalrotation. These data will help in the management of anterior shoulder dislocation and inform future biologic studies of this entity.

Materials and methods

Patients

From August 2009 to March 2011, 42 shoulders in 40 patients underwent arthroscopic or open Bankart repair for recurrent anterior shoulder dislocation. The patients with concomitant injuries shown by magnetic resonance imaging, such as complete rotator cuff tear, were excluded from this study. Also excluded were patients with severe glenoid bone loss or large Hill-Sachs lesions who underwent bone grafts or remplissage and 2 patients with concomitant capsular tears. Therefore, this study included 40 shoulders of 32 male and 6 female patients who were an average age at operation of 28.0 years (range, 13-73 years). Only 3 patients were aged older than 50 years.

All shoulders showed positive for the Rowe apprehension test before surgery. They did not show any other direction of instability, and no patients had a history of previous shoulder surgery. All 40 shoulders had Bankart lesions, of which 38 were treated by an arthroscopic Bankart procedure and 2 were treated by an open Bankart procedure augmented with a Bristow procedure.[21] No severe concomitant pathology was noted that needed to be repaired.

Computed tomography (CT) imaging showed no glenoid defect of more than 20% in any patient. Hill-Sachs lesions were also shallow and narrow in all patients by CT; therefore, no patient required a bone graft for glenoid bone loss or remplissage for a Hill-Sachs lesion. The Bristow procedure was performed for the rugby players, who requested more secure stabilization.

Assessment of anterior shoulder instability

With the patient under general anesthesia and supine before surgery, the anterior translation of the humeral head was examined by one senior surgeon (K.H.). The patient's arm was kept at 90° of abduction in the scapular plane. First, maximum external rotation and internal rotation were recorded with the scapula stabilized on the table to minimize the scapulothorathic motion. Second, we applied anterior stress manually and assessed anterior translation of the humeral head to the glenoid from maximum external rotation to maximum internal rotation in 10° increments. We recorded the range of rotational angle with each grade of translation. The anterior translation of each rotation was classified by the modified Hawkins Humeral Head Translation Grading system[1,9]:

Grade I: The humeral head rises up the glenoid slope but not over the glenoid rim.
Grade II: The humeral head rides up and over the glenoid rim but spontaneously reduces when stress is removed.
Grade III: The humeral head rides up and over the glenoid rim and remains dislocated on removal of stress.

Finally, we calculated the average of maximum rotational angle and minimum rotational angle that showed grade II translation. We also analyzed the average of the center of the rotational angle that showed more than grade II translation.

Statistical analysis

The unpaired t test was used to compare the difference between grade II and grade III groups. The significance level was set at $P = .05$.

Results

Grade I anterior translation was found in 5 shoulders, grade II in 27, and grade III in 8. We defined grade II and grade III as shoulders with dislocation under anesthesia; thereafter, we analyzed 35 shoulders that showed more than grade II translation.

The full range of rotation and the range in patients with grade II anterior translation are shown in Figure 1. The rotation range with grade II translation existed in the midrange of motion, and anterior dislocation was not recognized at maximum external and IR. The average ranges that showed grade II translation were from 52.2° of external rotation to 1.9° of internal rotation. The center of grade II translation was 24.8° of external rotation (Table I).

In shoulders with grade III anterior translation, all patients except one showed more than grade II translation