

# Comparison of Intra-articular Findings and Clinical Features Between Patients With Symptomatic Anterior Instability After Recurrent Shoulder Subluxation and Dislocation

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**Purpose:** The purpose of this study was to compare the prevalence of concomitant intra-articular pathologies and clinical manifestations after arthroscopic stabilization between patients with symptomatic anterior instabilities following recurrent shoulder subluxations and dislocations. **Methods:** Among patients who underwent arthroscopic stabilization, 28 patients who experienced shoulder subluxations (subluxation group,  $26.7 \pm 1.8$  years) and 84 who had shoulder dislocations (dislocation group,  $25.9 \pm 2.2$  years) were included. Recurrent shoulder subluxation was defined as instability caused by repeated injuries without a history of frank dislocation or manual reduction maneuver. Common inclusion criteria were positive clinical test of anterior instability and Bankart lesion with less than 25% of glenoid bone loss. The pathoanatomies in radiologic and arthroscopic examinations and postoperative clinical outcomes were compared. **Results:** The number of instability events was significantly fewer in the subluxation group ( $5.0 \pm 1.3$ ) than in the dislocation group ( $12.1 \pm 2.0$ ;  $P = .01$ ). The pathologic findings in preoperative radiology demonstrated no intergroup differences, except for the prevalence of Hill-Sachs lesions. In the subluxation group, the Hill-Sachs lesions were significantly less commonly detected with computed tomography and magnetic resonance arthrography (28.6%) than in the dislocation group (63.1%, 60.7%;  $P = .001$ ,  $P = .003$ , respectively). There were no significant differences in arthroscopic findings in both groups including superior labral anterior to posterior lesion (subluxation group, 39.3%; dislocation group, 45.2%), anterior labral periosteal sleeve avulsion lesion (21.4%, 29.8%), and bony Bankart lesion (21.4%, 28.6%). Preoperative and postoperative functional outcomes also did not differ between the groups. There was no statistical difference in terms of the rate of revision or postoperative subjective instability. **Conclusions:** Patients who had anterior instability after recurrent shoulder subluxation demonstrated a similar rate of concomitant intra-articular pathologies requiring the same level of management as recurrent shoulder dislocation. Recurrent shoulder subluxation also displayed similar functional outcomes and failure rate after arthroscopic stabilization procedures as recurrent dislocation. Thus, the clinical importance of symptomatic recurrent subluxation should be considered comparable with that of recurrent dislocation. **Level of Evidence:** Level IV, case control study.

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**D**islocation of the glenohumeral joint is defined as a complete separation of the articular surfaces documented by radiography or as an instability event requiring a manual reduction maneuver. On the other hand, the subluxation of the glenohumeral joint is defined as a symptomatic instability event that translates the humeral head on the glenoid fossa beyond the physiologic limits and returns to the normal glenohumeral position spontaneously without the manual reduction maneuver.<sup>1</sup> Shoulder instability can occur from both recurrent shoulder dislocation and subluxation.

However, the mechanism of the shoulder subluxation and its contribution to the occurrence of anterior instability are unclear. A few studies reported that among

patients who underwent a Bankart repair for anterior shoulder instability, 37% to 45% of the instability resulted from primary or recurrent subluxations.<sup>1,2</sup> Owens et al.<sup>3</sup> demonstrated higher prevalence of subluxation in military personnel, in whom primary or recurrent shoulder subluxation accounted for the 85% of all anterior instability episodes. After recurrent shoulder subluxations, the incidence of Bankart lesions confirmed during the arthroscopic procedure was reported to be from 82% to 100% as a constant pathologic lesion that required surgical treatment.<sup>4,5</sup> A recent study showed that the Bankart lesion was demonstrated on magnetic resonance imaging (MRI) in 96% of cases, even in first-time traumatic anterior shoulder subluxation.<sup>6</sup> Despite the large proportion of instability events and the high prevalence of concomitant labral lesions essential to anterior instability, anterior subluxation of the shoulder has been infrequently documented in the literature. The clinical manifestations and treatment modalities of symptomatic anterior shoulder subluxation have received little attention compared with dislocation.

The purpose of this study was to compare the prevalence of concomitant intra-articular pathologies and clinical manifestations after an arthroscopic stabilization procedure between patients with symptomatic anterior instabilities following recurrent shoulder subluxations and dislocations. We hypothesized that symptomatic recurrent subluxation leads to an incidence of concomitant intra-articular pathologies and post-operative clinical outcomes comparable to those of recurrent shoulder dislocation.

## Methods

The Institutional Review Board approved the study protocol, and informed consent was obtained from all participants. Patients who underwent arthroscopic stabilization procedures for anterior shoulder instability at one institution between 2009 and 2013 were retrospectively identified.

The inclusion criteria for the recruitment of the recurrent subluxation group were subluxation history after a frank shoulder injury without a history of manual reduction by a health care provider or a documented radiograph of dislocated shoulder, positive physical examination of anterior instability preoperatively, anterior labral pathologies such as Bankart or anterior labral periosteal sleeve avulsion (ALPSA) lesion on MR arthrography (MRA) with less than 25% of glenoid bone loss demonstrated on 3-dimensional computed tomography (3D-CT), and follow-up of more than 2 years. Recurrent shoulder subluxation in this study was defined as the instability caused by repeated injuries without a history of frank dislocation or manual reduction by a health care provider. The exclusion criteria were first-time shoulder dislocation, generalized

ligamentous laxity or multidirectional shoulder instability, revision surgery, absence of preoperative CT and MRA evaluation, history of medical conditions including seizure, and combined shoulder pathologies including full-thickness rotator cuff tear or fractures. However, the anterior shoulder subluxation is difficult to investigate because of an inadequately established definition and imprecise clinical manifestations. There is also a lack of objectivity even in the determination of the occurrence and no objective criteria exist regarding the determination of the number of subluxation episodes.

The control group comprised age-matched patients who underwent arthroscopic stabilization for recurrent shoulder dislocation in the same period. The inclusion and exclusion criteria for the recruitment of the recurrent dislocation group were almost identical to those of the recurrent subluxation group. However, patients who had a frank shoulder dislocation proved by a documented radiograph of dislocated shoulder or a history of manual reduction by a health care provider were included in the recurrent dislocation group. The demographic data including the age at operation and the first instability, gender, dominant extremity, interval between the last instability and surgery, total number of instability, and injury mechanism were reviewed from medical records.

## Clinical Evaluation

Preoperative 3D-CT and MRA images were interpreted by the senior orthopaedic surgeon and board-certified radiologist who were independently blinded to clinical history and each other's results. The presence of a bony Bankart lesion, anterior glenoid erosion, Hill-Sachs lesion, and SLAP lesions were interpreted using the images from the CT scan and MRA. A bony Bankart lesion was identified to be present when a defect in the contour of the anteroinferior glenoid with an obviously recognized bony fragment was observed.<sup>7</sup> Anterior glenoid erosion was considered to be present when bone loss of the anteroinferior glenoid surface without definite bony fragment was observed.<sup>8</sup> The presence of a Hill-Sachs lesion was defined when an abnormal contour, such as notched defect or flattening of posterolateral aspect of the superior portion of the humeral head, was observed in the axial plane and on either the coronal or sagittal planes on the level of the coracoid process.<sup>9</sup> ALPSA lesion was defined as an anteroinferior labral lesion with medially retracted labral tissue and contracted capsule.

Associated intra-articular pathologies confirmed during arthroscopic surgery were identified. The identified lesions were bony Bankart lesion, anterior glenoid erosion, Hill-Sachs lesion, ALPSA lesion, SLAP lesion, intra-articular loose body, and partial rotator cuff tear. Hill-Sachs lesion was considered to be present if there was either a chondral Hill-Sachs lesion, defined as a

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