Superior Labrum Anterior and Posterior Lesions and Microinstability

Eric Y. Chang, MD[a,b,*], Evelyne Fliszar, MD[b], Christine B. Chung, MD[a,b]

KEYWORDS

• SLAP • Microinstability • Superior labrum
• Periarticular fiber system

The glenohumeral joint provides the greatest range of motion of any joint in the human body. To achieve this mobility, complex interactions between several static and dynamic stabilizers must occur. Any injury that disturbs these interactions can lead to altered movement between the humeral head and the glenoid.

Over the past several decades, histologic studies, in vivo and in vitro biomechanical studies, and improved arthroscopic techniques have contributed to improved knowledge and treatment of abnormalities of the glenohumeral joint, including the labrum. In particular, continuing advances in magnetic resonance (MR) technology have allowed for improved noninvasive visualization of the stabilizers of the shoulder. In this article, the authors review the concept of glenohumeral joint microinstability and its relationship with superior labrum anterior and posterior (SLAP) lesions, review the role of the labrum as a stabilizer of the shoulder, and focus on the diagnosis and classification of SLAP lesions.

MICROINSTABILITY OF THE GLENOHUMERAL JOINT

Definition and Pathoetiology

The concept of microinstability is challenging from a clinical standpoint as well as in its description in the literature. There is no universally accepted definition. Furthermore, the literature describes microinstability in markedly different patient groups with multiple mechanisms of injury to different structures. At the most basic level, some use the term macroinstability interchangeably with dislocation and define microinstability as any rotational or directional pathologic laxity that leads to abnormal mechanics within the shoulder without frank dislocation.[1] A more specific and generally agreed definition of microinstability has been used to describe the pathology in the superior half of the glenohumeral joint with resultant abnormal translation of the humeral head on the glenoid.[2,3] This condition leads to subluxation without dislocation because of the limits to translation imposed by the coracoid, acromion, coracoacromial ligament, and rotator cuff.[2,4] A review of the literature yields 2 viewpoints of microinstability, a clinical classification group and a structural abnormality group, which are not mutually exclusive and demonstrate shared concepts.

In the clinical classification group, microinstability lies between the spectrum of TUBS (Traumatic instability, Unidirectional in nature, with a Bankart lesion typically responding to Surgery) and AMBRII (Atraumatic instability, Multidirectional in nature with Bilateral shoulder findings, which may respond

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[a] Department of Radiology, VA San Diego Healthcare System, 3350 La Jolla Village Drive, MC 114, San Diego, CA 92161, USA
[b] Department of Radiology, University of California San Diego Medical Center, 200 West Arbor Drive, San Diego, CA 92126, USA
* Corresponding author. Department of Radiology, VA San Diego Healthcare System, 3350 La Jolla Village Drive, MC 114, San Diego, CA 92161.
E-mail address: ericchangmd@gmail.com

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to a Rehabilitation program or require an Inferior capsular shift or Interval closure). Two distinct cohorts have been described classically: young individuals with chronic repetitive microtrauma from overhead motions (also referred to by some as AIOS, Acquired Instability in Overstressed Shoulder)[5–12] and those without chronic overhead motions.[10,13–15]

With regard to overhead athletes, and specifically in the throwing shoulder of baseball pitchers, some have classified internal impingement as microinstability.[2,16] Although abnormal function in overhead athletes may be a spectrum with some overlap of impingement and instability,[17] most of the literature on this topic delineates the 2 entities.[18,19] In 1991, Walch and colleagues[18,19] described internal impingement as an intra-articular impingement that occurs in all shoulders in the abducted externally rotated position. In this position, the undersurface of the posterosuperior rotator cuff may become pinched between the labrum and greater tuberosity. Some consider that this phenomenon of impingement leads to abnormality of the throwing shoulder,[20,21] whereas others do not.[22] Those that do not consider impingement to be a pathologic entity describe a separate pathologic cascade leading to the dead shoulder of throwing, which involves the SLAP lesion.[22] In this group, repair of the SLAP lesion with physical therapy is usually curative.[23]

Regarding the group of patients who do not use chronic forceful overhead motions, there are 2 additional subsets: those with trauma and those without trauma. The more common subset in this group is traumatic and includes most patients with SLAP lesions as described by Snyder and colleagues[13] (a total of 23 patients, 13 of whom had a compression force to the shoulder and 6 of whom had a sudden pull on the arm). This subgroup would also include most of the patients described by Savoie and colleagues[14] with superior labrum anterior cuff (SLAC) lesions (a total of 40 patients, 6 of whom were in motor vehicle accidents and 15 of whom had traumatic falls onto the shoulder). A much rarer subset of this second group of patients who do not use overhead motions is atraumatic with typical complaints of shoulder pain after a period of inactivity such as pregnancy or immobilization, classified as AMSI (Atraumatic Minor Shoulder Instability).[10] AMSI patients may have static anatomic variants of the middle glenohumeral ligament (MGHL) (absence, hypoplasia, or a Buford complex).[10,15] In the literature, the term minor instability has been used to encompass both AIOS and AMSI.[10]

Microinstability: Structural Abnormality Group of Literature

From the diagnostic radiologist's perspective, the structural abnormality class of microinstability is the more useful one. In the literature, this class of microinstability includes patients of varying ages with multiple mechanisms of injury. One article estimates that the incidence of microinstability is 5% in those with shoulder pain.[4] This group shares the etiology of acute trauma or repetitive stress, leading to injury of one or more supporting structures of the superior half of the glenohumeral joint, including injury to the labrum, MGHL, rotator interval structures, and rotator cuff. Injuries to any of these supporting structures can lead to predictable pathologic translation of the humeral head relative to the glenoid.

Labral injuries constitute the largest portion of this group (discussed in detail in the following sections). The MGHL has been shown to be an important secondary restraint to both inferior and anterior translation (**Fig. 1**).[24,25] Savoie and colleagues[9] reported on isolated MGHL avulsions in 33 patients with anterior instability, who were treated with improvement in pain and function.

The rotator interval includes the superior glenohumeral ligament (SGHL), coracohumeral ligament, glenohumeral[26] joint capsule, and biceps tendon, all of which contribute to stability.[27] The SGHL has been shown to be an important secondary restraint to anterior and superior translation of the humeral head in shoulder flexion and lesser degrees of abduction.[24,25] Injury to the SGHL can lead to anterosuperior instability (**Fig. 2**) and secondary impingement of the rotator cuff tendon.[9,28,29] With regard to this specific association, the term SLAC was introduced by Savoie and colleagues[14] to describe anterosuperior labral lesions, SGHL avulsion or injury, and anterior cuff pathology. Studies have shown that injury to the rotator interval or other containing structures can result in increased posterior and inferior translation with the arm in neutral position and increased anterior translation with the arm flexed 60°.[28,30–32]

LABRAL ANATOMY AND BIOMECHANICAL CONSIDERATIONS

The glenoid labrum is a vascularized ring of fibrous tissue that surrounds the bony glenoid.[33–35] The labrum serves numerous functions, including providing nutrition to the glenoid cavity and maintaining joint lubrication.[36] Biomechanically the labrum stabilizes the joint by deepening the glenoid fossa and increasing articular surface area