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Invited Expert Review

Multidirectional instability of the glenohumeral joint: Etiology, classification, assessment, and management

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ABSTRACT

Multidirectional instability of the shoulder is a type of glenohumeral joint shoulder instability. There are discrepancies in the definition and classification of this condition, which can make diagnosis and treatment selection challenging. Knowledge of contributing factors, the typical clinical presentation, and current best evidence for treatment options can assist in the diagnosis and appropriate treatment selection for this pathology. The purpose of this article is to present an overview of the current literature regarding the etiology, classification, assessment, and management of multidirectional instability of the glenohumeral joint.

Glenohumeral joint stability

Glenohumeral joint stability relies on a complex interaction between the passive bony and ligamentous restraints and dynamic neuromuscular control around the shoulder.[1,2] The ligamentous-capsular complex is lax in the midrange of shoulder motion and contributes more to resisting glenohumeral joint translation toward end ranges of motion as tension in these structures increases.[3] The glenohumeral joint is principally stabilized in the midrange by the concavity-compression mechanism delivered by the concurrent force couples of the rotator cuff muscles.[4] In conjunction with the deltoid, this concavity compression mechanism assists in centring the humeral head within the glenoid fossa and controlling humeral head translation. The scapular stability muscles are also imperative for maintaining glenohumeral joint stability by orientating the glenoid fossa under the humeral head during movement for optimum static and dynamic stability.[3] Both the passive and dynamic restraints provide feedback (proprioception) to the central nervous system, which assists in generating the appropriate efferent control to the dynamic restraints about the shoulder.[5] Glenohumeral joint instability can occur when any one of the passive or dynamic structures or central control processes are disrupted.

The classification of shoulder instability

Glenohumeral joint instability can be classified in a variety of ways, including etiology (traumatic vs atraumatic),[6,7] degree of instability (subluxation vs dislocation),[7] unidirectional or multidirectional,[8] the presence of generalized ligament laxity,[9] or the presence of volitional instability.[7-10] There are a number of shoulder instability classification systems across the literature[6-12] that attempt to encompass one or many of these instability traits; however, no system has gained universal acceptance.

Etiology is a particularly important consideration as the presence or the absence of trauma can assist with treatment selection.[8] Patients who have a significant history of trauma (such as a fall with

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resulting full glenohumeral joint dislocation) are more likely to sustain a structural lesion to the shoulder, resulting in a predominantly unidirectional instability. These patients generally have better outcomes with surgical stabilization.[8,10] Patients with an atraumatic or a microtraumatic history (such as repetitive overhead use of the arm) are less likely to have structural damage to the joint and more likely to have signs of poor motor control, scapular dyskinesis, and multiple directions of instability.[8,10] These patients generally have better outcomes with rehabilitation.[13,14]

The frequency, etiology, direction, severity (FEDS) classification system[11] is the only shoulder classification system that has been tested for reliability and content validity. The FEDS system categorizes shoulder instability based on patient-perceived FEDS of their symptoms. The system was developed by asking a cohort of patients if they had a feeling of slipping, falling out, dislocating, or looseness in their shoulder. Patients who answered yes were considered to have a chief complaint of shoulder instability, and this was confirmed with instability tests. Patients reporting more than 1 direction of instability were only classified with a primary direction of instability. The FEDS system eliminates the concept of multidirectional instability (MDI) all together, and this decision is somewhat contentious.[15] Inter-rater reliability was high for patient vs physician (direction only: 82% agreement, $k = 0.548$) physician vs self (84%-97%, $k = 0.687$-0.874) and physician vs other physician (82%-90%, $k = 0.437$-0.764).[12] The patient's perceived primary direction of instability may be useful clinically for the prescription of safe and appropriate exercises in the early stages of rehabilitation.[16,17] The FEDS system fails to acknowledge that pain could be a secondary sign of subtle instability in some patients,[18] disregards voluntary instability, and does not take into account the presence of structural lesions in the shoulder, which could significantly alter management.[19]

The Stanmore classification (Figure 1)[8] is the only classification system that allows for the often multifactorial and sometimes shifting nature of shoulder instability by classifying patients anywhere between 3 distinct poles of a triangle. Polar type 1 represents patients with traumatic structural (Bankart lesion and articular surface damage) unilateral instability with normal muscle patterning. Polar type II represents patients with atraumatic structural (dysfunctional capsule and normal articular surface) unidirectional or bidirectional instability with normal muscle patterning. Polar type III represents patients with atraumatic bilateral MDI with abnormal muscle patterning. Subgroups of instability exist between the 3 polar types.[8] The Stanmore classification however does not include specific directions (anterior, posterior, and inferior) of instability.

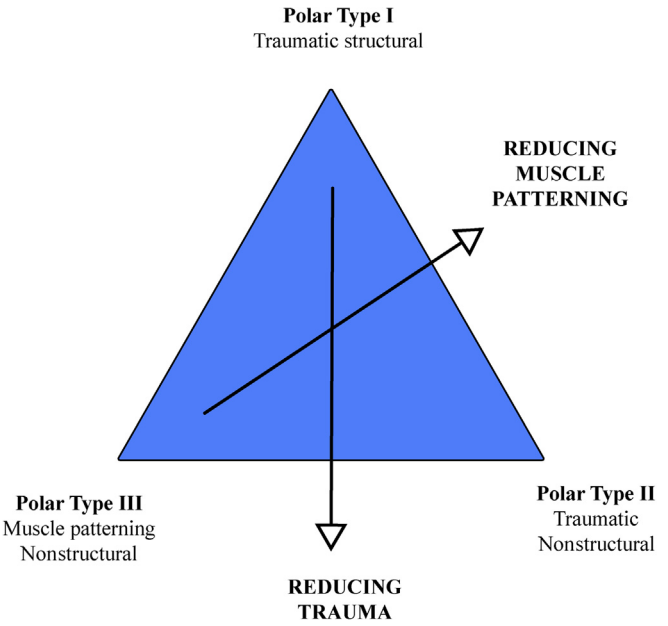

Figure 1. The Stanmore classification system. Recreated from Ref.[8] Copyright (2004) by Elsevier Ltd.

MDI: Definition and classification

Neer and Foster[20] were the first to report on a series of patients with MDI; all of whom had symptomatic involuntary subluxation or dislocation of the glenohumeral joint in the inferior as well as anterior and posterior directions. They attributed the condition to excessive capsular redundancy, distinguishing it as a different pathology from traumatic structural unidirectional instability. The sulcus sign, an objective test that tractions the arm to assess the presence of inferior instability, was described as the quintessential sign of MDI.[20]

Some patients with MDI present with a voluntary component of instability. This is a group of patients who are able to demonstrate their instability to the clinician. Rowe et al[21] administered psychological profile testing to a group of patients with voluntary instability and determined that those who scored poorly did not do as well with surgical intervention.[12,21] It has been suggested that there are 2 populations of people who can demonstrate their shoulder instability. Some are reluctant but can show their instability to the treating physician, typically with pain or discomfort (involuntary or demonstrable instability).[12,22,23] Others can demonstrate their instability for secondary gain or other issues (volitional instability).[8,12] Children and the preadolescent population tend to make up most of the voluntary dislocators.[8,10] The treatment of voluntary instability is education to cease the habit.[8]

Since its original description, there have been discrepancies across the literature on the definition, diagnostic criteria, and classification of MDI.[19,24] This is largely due to the variety of shoulder classification systems available, with no gold standard for defining and diagnosing MDI. Some authors define MDI as instability in 2[9,25-27] and some in all 3 directions.[8,20,28,29] Some authors include structural lesions (eg, Bankart, labral lesions) in their MDI diagnosis,[28,30-32] and some use laxity and subluxation over the glenoid rim as criteria for a positive test, instead of reproduction of symptoms.[28,32,33] Laxity of the glenohumeral joint differs from instability and refers to an asymptomatic hypermobile joint with the ability to maintain centring of the humeral head in the glenoid fossa. The term instability is used when this function is lost and results in symptoms of pain, discomfort, parethesia, apprehension, and/or fatigue.[34,35]

It has been shown that the number of patients diagnosed with MDI in a shoulder instability sample varies significantly depending on which classification system is used.[24] These variations have implications with regard to treatment choice (such as operative and nonoperative management) and continue to cause confusion for researchers interpreting results from intervention studies using heterogeneous MDI samples.[19,24]

Despite the difficulties in defining, diagnosing, and classifying MDI, McFarland et al[24] recommended that future studies should clearly state inclusion criteria for MDI and whether the patient population has instability in 2 or 3 directions; consider the etiology of instability as a key element for classification; ensure that the sulcus sign produces symptomatic instability and not just signs of laxity; and ensure reproducible and reliable assessment between assessors for participant inclusion.