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Generalized ligamentous laxity as a predisposing factor for primary traumatic anterior shoulder dislocation

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Hypothesis: The purpose of this study was to determine whether generalized ligamentous laxity and increased shoulder external rotation represent predisposing factors for primary traumatic anterior shoulder dislocation in young, active patients. We hypothesized that generalized ligamentous laxity and increased shoulder external rotation would be more common in individuals with first-time traumatic shoulder dislocations compared with controls.

Materials and methods: This retrospective case-control study examined hyperlaxity and shoulder external rotation >85° in 57 consecutive individuals (age <30 years) who sustained a primary traumatic anterior shoulder dislocation between 2003 and 2006. The Hospital Del Mar Criteria (battery of 10 clinical examination maneuvers) was used to measure generalized ligamentous laxity, which was determined to be present by overall scores exceeding 4/10 for men or 5/10 for women. The control group comprised 92 age-matched university students without a history of shoulder dislocation or anterior cruciate ligament injury.

Results: Generalized ligamentous laxity was present in 33.3% of the cases compared with 15.2% of controls ($P = .014$). Increased contralateral shoulder external rotation (>85°) was observed in 38.6% of the study group compared with 22.8% of controls ($P = .043$). Men who had dislocated their shoulder were 6.8 times more likely to demonstrate generalized ligamentous laxity and increased shoulder external rotation compared with age and sex matched controls ($P = .003$).

Discussion: Identifying hyperlax individuals may allow for shoulder-specific proprioceptive training.

Conclusion: Generalized joint laxity and increased external rotation in the contralateral shoulder were more common in patients who had sustained a primary shoulder dislocation.

Level of evidence: Level III, Retrospective Case Control Study, Treatment Study.

Keywords: Shoulder instability; anterior dislocation; generalized ligamentous laxity; risk factor proprioception; traumatic

The incidence of primary anterior shoulder dislocation in the general population has been reported to occur 8.2 to 23.9 per 100,000 person-years.[14] Hovelius et al[6] reported the incidence of primary shoulder dislocation was 1.7% in the general Swedish population, occurring at least 3 times more commonly in men than in women. The most common sequelae arising from a first-time shoulder dislocation in younger patients is recurrent instability, with an overall

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mean rate of 67% (range, 17%-96%).[21] A large number of studies have outlined risk factors for both primary and recurrent shoulder instability.[5,7,8,11,14,17,21] Generalized ligamentous laxity and increased shoulder external rotation, however, have not been demonstrated to be risk factors for primary shoulder dislocation or as a prognostic variable for recurrent shoulder dislocation.

Generalized joint laxity indicates that the range of motion across various joints in an individual is increased compared with the mean range of motion in the general population.[10] When identified in parallel with musculoskeletal problems the total condition is recognized as pathologic and is termed hypermobility syndrome.[10] The prevalence of nonpathologic generalized joint laxity in the general population has been demonstrated to be between 5% and 15%.[10,16] It becomes less common as individuals age and is slightly more prevalent in women than in men, as well as in the nondominant extremity. There is also some interracial variation, with an estimated prevalence as high as 57% in a particular African ethnic group.[16]

Generalized ligamentous laxity has already been proven to be a significant risk factor for anterior cruciate ligament (ACL) injury. Ramesh et al,[15] using the Beighton criteria, showed that 42.6% of patients with an ACL injury demonstrated generalized joint laxity vs 21.5% in controls and concluded that there is an intrinsic relationship among proprioception, increased joint laxity, and joint injury. Several other studies also point to the relationship between generalized joint laxity and increased risk of traumatic lower extremity injuries.[13,18,19]

The purpose of this study is to determine whether generalized ligamentous laxity, as measured by validated criteria, and increased shoulder external rotation are risk factors for primary traumatic anterior shoulder dislocation in young, active patients aged younger than 30 years. Our hypothesis is that generalized ligamentous laxity and increased shoulder external rotation are more common in people who sustain primary anterior shoulder dislocations than in the general population.

Materials and methods

This study was approved by the University of Western Ontario Research Ethics Board (REB Full Review # 9734).

This was a retrospective case-control study. General inclusion criteria for both the case and control groups were individuals who were skeletally mature, aged younger than 30 years, and who were able to provide informed consent for participation in the study.

The cases comprised 57 consecutive individuals presenting to a single institution from 2003 to 2006. All were diagnosed with an acute, first-time, traumatic anterior dislocation of the shoulder, as defined by (1) mechanism of abduction, external rotation; (2) sudden pain in the shoulder; and (3) manipulative reduction required or radiograph documenting an anterior shoulder dislocation. All shoulder injuries in the cases were sustained during recreational or competitive sporting activities. The study excluded individuals who had sustained an atraumatic shoulder dislocation.

Our control group comprised 92 age-matched undergraduate university students. The study excluded individuals who had a history of previous shoulder injury or knee ligament injury. In an attempt to control for activity level, individuals who volunteered to be in the control group but did not participate in local community or intramural collegiate sports teams were also excluded.

The control group was recruited by visiting undergraduate classes at a local university as well as intercollegiate sports teams (ice hockey, soccer, basketball, ultimate frisbee). To minimize sampling bias, recruitment only took take place on a large scale and did not target individuals. Potential participants were informed that their decision to participate was voluntary and that refusal to participate would not have any untoward consequences in any possible way.

The primary outcome measure was the presence or absence of generalized ligamentous laxity. This was assessed by using the Hospital Del Mar Criteria, a set of validated criteria.[3] Compared with previously published clinical measurement tools for generalized ligamentous laxity, the Hospital Del Mar Criteria have been shown to have improved internal reliability and homogeneity as well as better internal consistency coefficients.[3] The κ interrater values for the various Hospital Del Mar clinical tests range from 0.61 to 1.00.[3] The κ interrater value for the diagnosis of generalized ligamentous laxity has been reported to be 0.74 to 0.78.[10]

The secondary outcome was the presence or absence of shoulder external rotation (ER) exceeding 85°.[15] In the same way that excessive knee hyperextension has been postulated as a risk factor for ACL injury,[11] we hypothesized that shoulder ER might play a similar role in the pathogenesis of traumatic shoulder instability. The κ interrater value of 0.89 had been reported for shoulder ER exceeding 85°.[3]

Before the study commenced, 2 examiners were trained to administer the Hospital Del Mar criteria according to strict criteria.[3] After this, an agreement phase was undertaken on a sample of undergraduate medical students that were not included in the case or control group. An observed agreement of more than 80% was required to proceed with the study. The overall agreement for generalized ligamentous laxity was 0.95 (19 of 20 patients were classified equally, 3 as positive).

A brief physical examination, as defined by the Hospital Del Mar Criteria, was conducted on the cases and controls by 2 examiners. A goniometer was used for all angle measurements. The Hospital Del Mar score ranges from 0 to 10 and is derived by assigning one point for each:

1. passive hyperextension of the metacarpophalangeal joint of the little finger 90° or more;
2. passive apposition of the thumb to the flexor aspect of the forearm at less than 21 mm;
3. passive elbow hyperextension of 10° or more;
4. passive shoulder external rotation of 85° or more;
5. passive hip abduction of 85° or more;
6. hyperextension of the first metatarsophalangeal joint beyond 90°;
7. patellar hypermobility, defined as excessive passive displacement medially and laterally as assessed by 3 or more quadrants of displacement;
8. excessive range of passive ankle dorsiflexion and eversion of the foot with the knee flexed to 90°;
9. passive knee hyperflexion, defined as knee makes contact with the buttock); and,