Clin Orthop Relat Res (2012) 470:957–960
DOI 10.1007/s11999-011-1992-x

Clinical Orthopaedics and Related Research®
A Publication of The Association of Bone and Joint Surgeons®

SYMPOSIUM: ARTHROSCOPY

Do Patients With Traumatic Recurrent Anterior Shoulder Instability Have Generalized Joint Laxity?

Maximiliano Ranalletta MD, Santiago Bongiovanni MD, Federico Suarez MD, Juan Manuel Lopez Ovenza MD, Gaston Maignon MD

Published online: 26 July 2011

Abstract

Background A number of studies suggest a relationship between generalized joint laxity (GJL) and increased risk of some musculoskeletal injuries. However, there are conflicting data on the association between GJL and traumatic recurrent shoulder instability (RSI).

Questions/purposes We therefore asked whether the incidence of GJL in patients with RSI was greater than that in a control group.

Methods We preoperatively determined GJL with a Beighton score in 100 male patients arthroscopically treated for RSI. The mean age of the patients was 25 years. We identified a control group of 100 individuals, matched for age and gender, with no known history of instability of the shoulder, knees, or ankles and obtained the same score. Those patients with a Beighton score greater than six points were considered lax (representing GJL).

Results We identified no difference in the rate of GJL in the two groups: 13 of the 100 patients versus nine of the 100 control subjects.

Conclusion Our data add to the literature suggesting GJL does not predispose to RSI.

Level of Evidence Level II, prognostic study. See Guidelines for Authors for a complete description of levels of evidence.

Introduction

A number of studies suggest individuals with generalized joint laxity (GJL) are at an increased risk for musculoskeletal injury [3, 6, 7, 14, 19, 23]. Several studies for different abnormalities have tried to establish this correlation. Ramesh et al. assessed GJL in a group of patients with ACL rupture and compared it with a control group using the Beighton score. The authors evaluated 169 patients and found ACL injury is more common in those patients with joint laxity and particularly so for those with hyperextension of the knee [19]. Erkula et al. studied the relation of GJL and trunk rotation. Using the Beighton score to determine laxity, the authors found a relationship between scoliosis and GJL [8]. This finding is also supported by the studies conducted by other authors [3, 23].

Traumatic anterior instability is the most common form of shoulder instability and may progress to recurrent episodes. The reported incidence of recurrent instability varies widely in the literature with rates ranging from 17% to almost 100% [10, 14, 18, 21, 25]. Several authors have identified youth, male gender, early return to competitive contact sport, and poor compliance with a rehabilitation protocol as risk factors for recurrent dislocation [11, 17].

Although GJL reportedly predisposes to a number of musculoskeletal disorders [3, 8, 19], the evidence supporting GJL as a predisposing factor in recurrent anterior shoulder instability is conflicting [5, 17]. Pollock and

Each author certifies that he has no commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.
Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

M. Ranalletta (✉), S. Bongiovanni, F. Suarez, J. M. L. Ovenza, G. Maignon
Hospital Italiano de Buenos Aires, Shoulder Unit Orthopaedic Service, Ciudad Autónoma de Buenos Aires, Buenos Aires, Ack 1199, Argentina
e-mail: mranalletta@yahoo.es

Bigliani [17] suggested a causal relationship between traumatic instability and GJL, whereas Cofield et al. found no relationship [5].

We therefore asked whether the incidence of GJL in patients with recurrent shoulder instability (RSI) was greater than that in a control group.

Patients and Methods

We prospectively assessed GJL in all 100 male patients with RSI treated arthroscopically from October 2004 to September 2006. We identified a control group comprised of 100 males matched for age with no known history of shoulder injury, knee ligament injury, or ankle sprain who attended the central emergency with no traumatic disease. All subjects were tested for GJL with the Beighton score [2]. General inclusion criteria for both the case and control groups were males who were skeletally mature and aged older than 16 years. For the case group, anterior traumatic shoulder dislocation with at least two episodes of instability and the first episode when the patient was at least 16 years old were also inclusion criteria. Traumatic shoulder anterior dislocation was 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. Exclusion criteria were: (1) individuals who had sustained an atraumatic shoulder dislocation or presented posterior or multidirectional instability; (2) first-time episodes; (3) patients with bone deficiency requiring an open procedure; and (4) revision surgeries. In the period of time this study was conducted, only nine women were arthroscopically treated for RSI so females were also excluded from the statistical analysis.

To determine the sample sizes, we based on a pilot study conducted a priori to evaluate the percentage of cases of RSI exposed (having generalized joint laxity). Data were obtained from our patient database and included 70 consecutive patients with shoulder instability. Forty percent of these patients had a Beighton score over 6 and thus met the criterion for GJL [20]. With a 40% proportion of exposed cases, and assuming an expected odds ratio of 2, we needed 99 patients in each group to reach a power of 87.5% with the Yates correction (95% confidence interval). This information was determined by our biostatical department using the Epidat 3.1 software (World Health Organization, Washington, DC).

General inclusion criteria for both the case and control groups were males who were skeletally mature and aged older than 16 years. In the case group, the mean patient age was 25.1 years (range, 16–42 years) (95% confidence interval [CI], 24.7–27.1) and in the control group the mean patient age was 25.9 (range, 16–42 years) (95% CI, 23.8–26.4).

One of us (FS) blinded to knowledge of the presence or absence of RSI assessed GJL using the Beighton score. This score ranges from 0 to 9 and is derived by assigning one point each for: (1) hyperextension of the metacarpophalangeal joint of each little finger beyond 90°; (2) ability to touch the volar surface of each forearm with the thumb; (3) hyperextension of each elbow; (4) hyperextension of each knee; and (5) the ability to place the palm of both hands flat on the ground by forward flexion with the knees straight. A score of greater than 6 indicates hypermobility and increased joint laxity [20]. The Beighton score was chosen because it is quick and easy to perform and although it is a subjective method for measuring joint laxity, it has an acceptable intraobserver and interobserver reliability [4, 8]. One of the authors (FS) trained in performing the Beighton score blinded to the purpose of the study assessed all patients in both groups.

We used a chi square test to determine whether there was a difference in the frequency of GJL between the cases and control subjects. Statistical analyses were performed on SPSS 15 software (SPSS Inc, Chicago, IL).

Results

The case and control groups had similar rates ($p = 0.36$) of GJL: 13 patients (13%) in the case group and nine patients (9%) in the control group (odds ratio, 1.5; 95% CI, 0.6–3.7).

Discussion

Although a number of studies suggest a relationship between GJL and increased risk of some musculoskeletal injuries, there are conflicting data on the association between GJL and traumatic RSI. We therefore asked whether the incidence of GJL in a group of our patients with RSI was greater than that in a control group.

Several limitations in our study should be mentioned. First, we included a selected group of patients; only males between 16 and 42 years old were analyzed because the vast majority of the patients with shoulder instability attending our institution are men. Only nine women were surgically treated in the period of the study so they were not included. We also excluded women because they reportedly have an increased incidence of GJL. Beighton et al. [1] reported females were more mobile than males at any age. These findings are consistent with other research reporting greater levels of joint hypermobility and hyperlaxity in women than in men [1, 9]. Because women were

excluded, the results of our study cannot be extrapolated to the general population. Second, the Beighton score does not include any shoulder ROM measurement so the potential shoulder laxity was not compared between groups. However, the point of our study was whether GJL, not shoulder laxity per se, was related to RSI. Third, the anterior drawer test and sulcus test are subjective evaluations of shoulder laxity. Previous authors have reported poor reproducibility and poor diagnostic value using these subjective evaluations [12, 13, 24]. Furthermore, it has been suggested that the results from glenohumeral laxity tests depend on factors such as the experience of the examiner, the inconsistencies of force applied, humeral head centering, patient positioning, and muscular tension [5, 12, 16]. To avoid the limitations of these subjective evaluations, Sauers et al. objectively characterized in vivo glenohumeral joint laxity using an instrumented shoulder arthrometer [22]. They compared measures of glenohumeral joint laxity and GJL and assessed passive shoulder flexion, extension, and abduction and passive isolated glenohumeral internal rotation and external rotation at 90° of abduction. Assessment of GJL was achieved for the presence or absence of hyperlaxity using a modified Beighton score. They concluded the modified Beighton score did not correlate highly with any of the passive ROM values (range, 0.01–0.48). Finally, the Beighton score in both groups was obtained by one trained physician manner. Thus, although we did not determine inter- or intraobserver reliability, it does appear reliable. One study found an interobserver reliability was 0.86 [8], whereas another reported agreement of 81% for intrarater testing and 89% for interrater testing of joint mobility index scores [4].

The literature regarding GJL and shoulder instability is contradictory. McFarland et al. found a higher index of GJL in athletes with increased posterior shoulder translation compared with those without this translation [15]. Pollock and Bigliani have also suggested a causal relationship between traumatic instability and GJL [17]. However, other investigators found no correlation between GJL and shoulder instability. In a study of 55 patients examined under anesthesia, Cofield et al. found no relationship between the presence of shoulder instability and GJL [5]. Emery and Mullaji compared the anterior and posterior drawer tests and the sulcus test with GJL in 75 school children. Positive signs for instability were compared with percentile grades of GJL. They concluded that GJL was not a major factor in producing signs of shoulder instability [7]. We also identified no difference in the rate of GJL in the two groups: 13 of the 100 patients versus nine of the 100 control subjects.

Although our study is not definitive, it does add to the body of literature suggesting GJL does not predispose to RSI.

References

1. Acasuso-Diaz M, Collantes-Estevex E, Sanchez-Guijo PS. Joint hyperlaxity and musculoskeletal lesions: study of a population of homogeneous age, sex, and physical exertion. *Br J Rheumatol.* 1993;32:120–122.
2. Beighton P, Solomon L, Soskolne CL. Articular mobility in an African population. *Ann Rheum Dis.* 1973;32:413–418.
3. Binns M. Joint laxity in idiopathic adolescent scoliosis. *J Bone Joint Surg Br.* 1988;70:420–422.
4. Boyle KL, Witt P, Riegger-Krugh C. Intrarater and interrater reliability of the Beighton and Horan Joint Mobility Index. *J Athl Train.* 2003;38:281–285.
5. Cofield RH, Nessler JP, Weinstabl R. Diagnosis of shoulder instability by examination under anesthesia. *Clin Orthop Relat Res.* 1993;291:45–53.
6. Cooper RA, Brems JJ. The inferior capsular-shift procedure for multidirectional instability of the shoulder. *J Bone Joint Surg Am.* 1992;74:1516–1521.
7. Emery RJ, Mullaji AB. Glenohumeral joint instability in normal adolescents. Incidence and significance. *J Bone Joint Surg Br.* 1991;73:406–408.
8. Erkula G, Kiter AE, Kilic BA, Er E, Demirkan F, Sponseller PD. The relation of joint laxity and trunk rotation. *J Pediatr Orthop B.* 2005;14:38–41.
9. Finesterbush A, Pogrund H. The hypermobility syndrome: musculoskeletal complaints in 100 consecutive cases of generalized joint hypermobility. *Clin Orthop Relat Res.* 1982;168:124–127.
10. Henry JH, Genung JA. Natural history of glenohumeral dislocation–revisited. *Am J Sports Med.* 1982;10:135–137.
11. Kralinger FS, Golser K, Wischatta R, Wambacher M, Sperner G. Predicting recurrence after primary anterior shoulder dislocation. *Am J Sports Med.* 2002;30:116–120.
12. Levy AS, Lintner S, Kenter K, Speer KP. Intra- and interobserver reproducibility of the shoulder laxity examination. *Am J Sports Med.* 1999;27:460–463.
13. Lintner SA, Levy A, Kenter K, Speer KP. Glenohumeral translation in the evaluation of general laxity in competitive swimmers asymptomatic athlete's shoulder and its relationship to other clinically measurable anthropometric variables. *Am J Sports Med.* 1996;24:716–720.
14. Marans HJ, Angel KR, Schemitsch EH, Wedge JH. The fate of traumatic anterior dislocation of the shoulder in children. *J Bone Joint Surg Am.* 1992;74:1242–1244.
15. McFarland EG, Campbell G, McDowell J. Posterior shoulder laxity in asymptomatic athletes. *Am J Sports Med.* 1996;24:468–471.
16. Oliashirazi A, Mansat P, Cofield RH, Rowland CM. Examination under anesthesia for evaluation of anterior shoulder instability. *Am J Sports Med.* 1999;27:464–468.
17. Pollock RG, Bigliani LU. Recurrent posterior shoulder instability. Diagnosis and treatment. *Clin Orthop Relat Res.* 1993;291:85–96.
18. Postacchini F, Gumina S, Cinotti G. Anterior shoulder dislocation in adolescents. *J Shoulder Elbow Surg.* 2000;9:470–474.
19. Ramesh R, Von Arx O, Azzopardi T, Schranz PJ. The risk of anterior cruciate ligament rupture with generalised joint laxity. *J Bone Joint Surg Br.* 2005;87:800–803.
20. Robinson CM, Dobson RJ. Anterior instability of the shoulder after trauma. *J Bone Joint Surg Br.* 2004;86:469–479.
21. Rowe CR. Prognosis in dislocations of the shoulder. *J Bone Joint Surg Am.* 1956;38:957–977.
22. Sauers EL, Borsa PA, Herling DE, Stanley RD. Instrumented measurement of glenohumeral joint laxity and its relationship to passive range of motion and generalized joint laxity. *Am J Sports Med.* 2001;29:143–150.

23. Tanchev PI, Dzherov AD, Parushev AD, Dikov DM, Todorov MB. Scoliosis in rhythmic gymnasts. *Spine (Phila Pa 1976).* 2000;25:1367–1372.
24. Warner JJ, Micheli LJ, Arslanian LE, Kennedy J, Kennedy R. Patterns of flexibility, laxity, and strength in normal shoulders and shoulders with instability and impingement. *Am J Sports Med*. 1990;18:366–375.
25. Wheeler JH, Ryan JB, Arciero RA, Molinari RN. Arthroscopic versus nonoperative treatment of acute shoulder dislocations in young athletes. *Arthroscopy.* 1989;5:213–217.