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Hand dominance in traumatic shoulder dislocations

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Background: Shoulder dislocations are common injuries among athletes. Patients with instability after their injury often require stabilization procedures for treatment. The primary outcome measure was to see whether there was any correlation between the side of traumatic shoulder dislocation and dominance of hand. Secondary outcomes were to look at subgroups of age and sporting discipline.

Materials and methods: This study recruited all patients with a frank dislocation that required arthroscopic surgical stabilization who attended the same private orthopedic surgeon. Exclusion criteria included injury without frank dislocation, nonsport-related injuries, and ambidexterity. Data were collected for 325 of 365 patients (89.0% response rate)

Results: There were 278 right hand-dominant patients (85.5%), with 136 (48.9%) requiring arthroscopic stabilization of their dominant side for dislocation. Of the remaining 47 left hand-dominant patients, 17 (36.2%) required operations on their dominant arm. In total, 153 patients (47.1%) dislocated their dominant shoulder and 172 (52.9%) dislocated their nondominant shoulder, with an odds ratio of 1.692 (95% confidence interval, 0.893-3.205).

Conclusions: This study suggests that there is no statistical significance between the side of shoulder dislocation and hand dominance of patients with shoulder dislocation. Future research could investigate further the causal relationship between hand dominance and mechanisms of injury.

The glenohumeral joint (shoulder) is the most commonly dislocated joint in the human body, with a 1% to 2% lifetime prevalence in the general population and 7% in athletes.[6,8,12] Previous studies have shown that the incidence of shoulder dislocation can range from 11.2 to 23.9 per 100,000.[3,14,19] The highest risk population are young men aged 16 to 30 years and elderly women aged between 60 and 80.[4,6,8]

The most common cause for dislocation is by violent or accidental trauma, which is commonly seen in contact sports.[5,18,19] In rugby, 80% of shoulder injuries were dislocations and an Australian Rules Football League injury report showed that rates of shoulder injuries have been increasing, with the incidence rates nearly doubling (from 1.0 to 1.8) during an 11-year period (1997-2008).[11,15]

Complications resulting from acute shoulder dislocations have been reported in up to 55% of cases, with the most common of these being fracture and neurologic damage.[1,6,16] There is a 10% to 15% risk of rotator cuff tears occurring in people aged <30 years,[1,4,6] and younger patients (<20 years) have been estimated to have recurrent dislocation rates of up to 95%.[2,4,10]

Previous studies have documented hand dominance as an incidental finding in the evaluation of the population, but none have formally evaluated the significance of the rates of traumatic shoulder dislocation with dominance of hand.[8,17] This study aimed to bridge the gap in the literature and provide additional information about shoulder dislocations, dominance of hand, and the significance of the sport discipline played, driving additional research into sporting-related shoulder dislocations. Ultimately, this study has the potential to influence the future training techniques in contact sports to prevent shoulder injury and ongoing complications.

Materials and methods

Inclusion criteria for this retrospective study included a first episode of traumatic shoulder dislocation with ongoing instability that required arthroscopic surgical repair (shoulder arthroscopic stabilization for recurrent instability including labral repair or reattachment, Medicare Benefits Schedule in Australia) conducted by 1 surgeon at a private orthopedic practice. We identified 1012 patients between January 2002 and January 2012. Patients were

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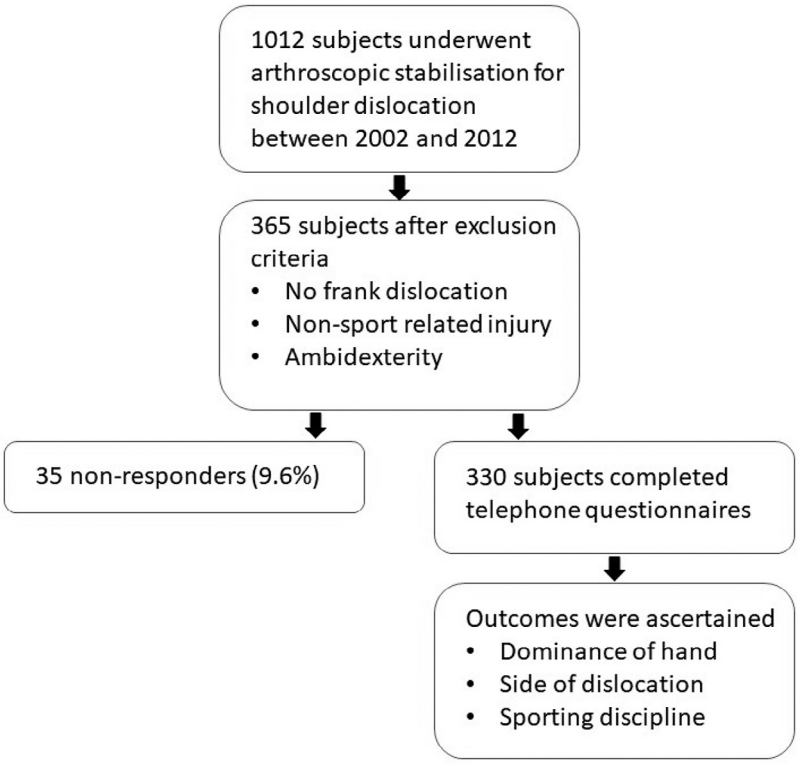

Figure 1 Methodology for the recruitment of patients.

excluded if they sustained their injury without a frank dislocation, (2) did not experience sporting-related injuries, or (3) identified as ambidextrous. Nine patients were excluded because of ambidexterity, which was defined as use of both the left and right arms regularly for common activities of daily living (ie, writing, using a computer mouse, throwing, catching). The most common example being individuals who write left handed but throw a ball right handed. A diagram of the methodology can be seen in Fig. 1.

Item number 48957 on the Medicare Benefits Schedule involves an arthroscopic surgical stabilization of the shoulder for recurrent instability with, or without labral repair. The technique initially involved mobilization of the labarum from the glenoid neck. This was followed by preparation of glenoid neck to bleeding bone. The arthroscopic stabilization was done with bioabsorbable anchors and involved 3 anchors with 1 arthroscopic knot per anchor. The anchors were placed at the 5 o'clock, 4 o'clock, and 3 o'clock positions. A single limb was passed through the soft tissue, followed by arthroscopic knots (Weston knot) with 3 half-hitches alternating the post.

Parameters of age, type of dislocation (anterior/posterior), side of dislocation, hand dominance, and sport discipline at time of injury were recorded. The primary outcome measure was the side of traumatic shoulder dislocation with respect to the dominance of hand of the patient, which was subjectively defined by the patient. Secondary outcome measures included sporting discipline. A further analysis grouped the data by age younger or older than 22 years. We chose this age because a previous study showed that patients younger than 22 were at higher risk of repeat dislocation.[9]

All statistical analyses were performed using SPSS software (IBM Australia Ltd, St Leonards, NSW, Australia). We used χ^2 testing to assess whether there was a significant difference in the frequency of nondominant compared with dominant shoulder dislocations. An odds ratio was calculated to determine the risk of dislocating the nondominant shoulder compared with the dominant shoulder. The *P* value of <.05 was considered significant. All data were calculated to 3 significant figures.

Results

There were 365 patients eligible for the study, and data were collected on 325 (89.0% response rate). Patients were a mean age of 21.3 years (range, 10-55 years). There were 279 male (85.8%) and 46 female (14.2%) patients. The dislocation was anterior in 302 patients (92.9%).

There were 278 right-hand dominant patients (85.5%), with 136 (48.9%) requiring arthroscopic stabilization of their dominant side for dislocation. Of the remaining 47 left hand-dominant patients, 17 (36.2%) required operations on their dominant arm. The dominant shoulder was dislocated in 153 patients (47.1%) and the nondominant shoulder in 172 (52.9%), with an odds ratio of 1.692 (95% confidence interval, 0.893-3.205). Results of χ^2 testing are reported in Table I.

Table I
Results of χ^2 tests and the odds ratio for dominance of hand against side of shoulder dislocation

Tests	Value	*df*	Significance		
			Asymp (2-sided)	Exact (2-sided)	Exact (1-sided)
Pearson χ^2	2.641*	1	0.104		
Fisher's exact test†				0.116	0.071
Valid cases, No.	331				
Odds ratio (95% CI)	1.692‡ (0.893-3.205)				

CI, confidence interval.
* 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.15.
† Computed only for a 2×2 table.
‡ Binomial distribution used.

Table II
Breakdown by age of the number of patients for hand dominance and side of shoulder stabilization procedure

Variable	<22 years old (n = 210)	>22 years old (n = 115)
Age, yr	17.4 (10-21)	28.5 (22-55)
Sex		
Male	187 (89.0)	92 (78.4)
Female	23 (11.0)	26 (22.6)
Hand dominance		
Right	178 (84.8)	100 (87.0)
Left	30 (14.3)	15 (13.0)
Operation on		
Right arm	110 (52.4)	55 (47.8)
Left arm	100 (47.6)	60 (52.2)
Right hand dominant and operation on		
Right arm	91	43
Left arm	88	55
Left hand dominant and operation on		
Right arm	12	6
Left arm	19	11
Operation on		
Dominant arm	103 (49.0)	54 (47.0)
Nondominant arm	107 (51.0)	61 (53.0)

Continuous data are shown as mean (range) and categoric data as number (%) or as number of patients.

Table III
Breakdown of the number of patients for hand dominance and side of shoulder stabilization procedure for individual sports

Sporting discipline	Hand dominance	Operation side, No.		Total
		Left	Right	No. (%)
Cricket	Left	0	0	6 (1.9)
	Right	2	4	
Football (AFL)	Left	8	8	115 (35.4)
	Right	49	50	
Netball	Left	0	0	14 (4.3)
	Right	5	9	
Other	Left	1	6	45 (13.8)
	Right	21	17	
Rugby	Left	1	1	28 (8.6)
	Right	17	9	
Snowboarding	Left	2	0	14 (4.3)
	Right	10	2	
Soccer	Left	0	1	7 (2.2)
	Right	2	4	
Surfing	Left	2	1	18 (5.5)
	Right	7	8	
Water polo	Left	0	1	9 (2.8)
	Right	5	3	
Water skiing	Left	0	0	6 (1.9)
	Right	3	3	
Weight lifting	Left	0	0	11 (3.4)
	Right	7	4	

AFL, Australian Football League.

The population was divided by age younger than 22 years and older than 22 based on the mean age of the population. Breakdown of these groups is summarized in Table II. The total population was further broken down into individual sporting disciplines, the most common of which are listed in Table III. Australian Rules Football was the largest contributor, having 115 of 325 all dislocations (35.4%), with 58 (50.4%) occurring in the nondominant shoulder. Of the male patients, 129 (46.2%) dislocated their dominant shoulder and 150 (53.8%) dislocated their nondominant shoulder. For female patients, 25 (54.3%) dislocated their dominant shoulder and 21 (45.7%) dislocated their nondominant shoulder.

Discussion

The shoulder is one of the most commonly dislocated joints to present to the emergency department and to orthopedic practices.[4] The results indicated that patients are only 5.7% more likely to dislocate their nondominant shoulder; therefore, there is great difficulty in predicting the side of dislocation based on the patient's hand dominance. Furthermore, evidence suggests that dislocations are equally likely to occur in the dominant and nondominant shoulder.

The correlation between young men sustaining shoulder dislocations while playing sport has been previously highlighted.[13] Sundaram et al[17] evaluated shoulder injuries (not dislocation specifically) in rugby players, showing that 57.5% of the players injured their nondominant arm. The study mentioned that this was an unexpected finding and theorized that this may be due to differences between coordination and strength.[17] Hoelen et al,[8] in 1990, monitored 194 patients during a 4-year period to determine complications and recurrence rates of shoulder dislocations. They concluded that athletes injured both dominant and nondominant arms equally but did not discuss the matter further.[8] To the best of our knowledge, this is the first study to specifically evaluate dominance of hand and the subsequent side of dislocation.

Multiple factors may contribute to the results gathered. One current hypothesis is that athletes would have higher rates of glenohumeral dislocation in their nondominant side due to a decrease in coordination and stabilizing muscle bulk on that side. However, a preference to use the dominant side could account for an increase in the number of dominant side dislocations. Finally, a combination of these 2 theories could account for similar dislocation rates between the 2 groups, but further research would be required. Furthermore, future research could focus on the level of sport played (ie, amateur or professional) or the sporting prowess or abilities of each player as well as the mechanism of injury (ie, tackle, fall).

Limitations of the study include the use of a single private practice in a metropolitan area that may not accurately represent the wider population. However, the participants in this study closely resembled the current population of Western Australia, with the most recent survey showing 9.8% are left handed and 66% to 90.2% are right handed, with many being mixed depending on the activity.[7]

Although the response rate was high, all retrospective studies are limited by the nonresponder population. A potential weakness of the investigation is the relative paucity of female patients compared with male patients that could not be controlled for.

This study did not evaluate patients who elected to have nonsurgical management for their dislocation. Furthermore, the vast array of sporting disciplines made further analysis within each sport difficult except for Australian Rules Football. Finally, this study contained mostly young fit and healthy participants and may not be relevant if extrapolated to the older age groups.

Conclusion

This retrospective study suggests that there is no significant difference between the side of shoulder dislocation and hand dominance of patients who sustain shoulder dislocations requiring shoulder stabilization surgery. Therefore, sporting-induced traumatic shoulder dislocations are equally likely in the individual's dominant and nondominant arm. This indicated that predicting the future side of injuries by the person's dominance of hand is difficult. Future prospective cohort studies should investigate the relationship between specific sporting disciples with mechanisms of injury and consider the dominance of hand.

Disclaimer

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References

1. Beeson M. Complications of shoulder dislocation. Am J Emerg Med 1999;17:288-95.
2. Brophy R, Marx R. The treatment of traumatic anterior instability of the shoulder: nonoperative and surgical treatment. Arthroscopy 2009;298-304. http://dx.doi.org/10.1016/j.arthro.2008.12.007
3. Chahal J, Leiter J, McKee MD, Whelan D. Generalized ligamentous laxity as a predisposing factor for primary traumatic anterior shoulder dislocation. J Shoulder Elbow Surg 2010;19:1238-42. http://dx.doi.org/10.1016/j.jse.2010.02.005
4. Chalidis B, Sachinis N, Dimitriou C, Papadopoulos P, Samoladas E, Pounaras J. Has the management of shoulder dislocation changed over time? Int Orthop 2007;31:385-9. http://dx.doi.org/10.1007/s00264-006-0183-y
5. Dorland WA. Dorland's illustrated medical dictionary. 31st edition. Philadelphia: Saunders; 2007 ISBN 9781416023647.
6. Cutts S, Prempeh M, Drew S. Anterior shoulder dislocation. Ann R Coll Surg Engl 2009;91:2-7. http://dx.doi.org/10.1308/003588409X359123
7. Dragovic M, Hammond G. A classification of handedness using the Annett Hand Preference Questionnaire. Br J Psychol 2007;98:375-87. http://dx.doi.org/10.1348/000712606X146197
8. Hoelen MA, Burgers AM, Rozing PM. Prognosis of primary anterior shoulder dislocation in young adults. Arch Orthop Trauma Surg 1990;110:51-4.
9. Hovelius L, Olofsson A, Sandström B, Augustini BG, Krantz L, Fredin H, et al. Nonoperative treatment of primary anterior shoulder dislocation in patients forty years of age and younger: a prospective twenty-five-year follow-up. J Bone Joint Surg Am 2008;90:945-52. http://dx.doi.org/10.2106/JBJS.G.00070
10. Jakobsen B, Johannsen H, Suder P, Søjbjerg J. Primary repair versus conservative treatment of first-time traumatic anterior dislocation of the shoulder: a randomized study with 10-year follow-up. Arthroscopy 2007;118-23. http://dx.doi.org/10.1016/j.arthro.2006.11.004
11. Kaplan KM, Goodwillie A, Strauss EJ, Rosen JE. Rugby injuries: a review of concepts and current literature. Bull NYU Hosp Jt Dis 2008;66:86.
12. Karatsolis K, Athanasopoulos S. The role of exercise in the conservative treatment of the anterior shoulder dislocation. J Bodyw Mov Ther 2006;10:211-9. http://dx.doi.org/10.1016/j.jbmt.2005.10.008
13. Krøner K, Lind T, Jensen J. The epidemiology of shoulder dislocations. Arch Orthop Trauma Surg 1989;108:288-90.
14. Liavaag S, Svenningsen S, Reikerås O, Enger M, Fjalestad T, Pripp AH, et al. The epidemiology of shoulder dislocations in Oslo. Scand J Med Sci Sports 2011;21:334-40. http://dx.doi.org/10.1111/j.1600-0838.2011.01300.x
15. Orchard J, Seward H. Injury report 2008–Australian Football League <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.631.7385&rep=rep1&type=pdf>; 2009, accessed November 13, 2017.
16. Perron A, Ingerski MS, Brady WJ, Erling BF, Ullman EA. Acute complications associated with shoulder dislocation at an academic emergency department. J Emerg Med 2003;24:141-5. https://doi.org/10.1016/S0736-4679(02)00717-5
17. Sundaram A, Bokor DJ, Davidson AS. Rugby Union on-field position and its relationship to shoulder injury leading to anterior reconstruction for instability. J Sci Med Sport 2011;14:111-4. http://dx.doi.org/10.1016/j.jsams.2010.08.005
18. World Health Organization. ICD-10: International statistical classification of diseases and related health problems. Geneva, Switzerland: World Health Organization; 1992. ISBN 9789241544207.
19. Zacchilli M, Owens BD. Epidemiology of shoulder dislocations presenting to emergency departments in the United States. J Bone Joint Surg Am 2010;92:542-9. http://dx.doi.org/10.2106/JBJS.I.00450