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Operative shoulder instability injury management in Australian Football League players: A case series

Jason Bonacci[a,*], Brent Manson[a], Steven J. Bowe[b], Stephen Gill[c], Hugh Seward[d], Greg Hoy[e], Richard Page[f,g]

[a] Centre for Sports Research, School of Exercise and Nutrition Sciences, Deakin University, Australia
[b] Deakin Biostatistics Unit, Faculty of Health, Deakin University, Australia
[c] Physiotherapy Department, Barwon Health, Australia
[d] Newtown Medical Centre, Australia
[e] Melbourne Orthopaedic Group, Australia
[f] School of Medicine, Deakin University, Australia
[g] Barwon Centre for Orthopaedic Research and Education (B-CORE), St John of God Hospital and University Hospital, Australia

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ABSTRACT

Objectives: The purpose of this study was to review the surgical management procedures of shoulder instability injuries in Australian Football League (AFL) players, and determine outcomes regarding return to sport and injury recurrence.
Design: Retrospective cohort study.
Methods: Elite AFL players with shoulder instability resulting in surgery were assessed in a retrospective cohort design (72 players/77 shoulders). Type of initial injury, surgical management, return to sport and injury recurrence were obtained. The mean follow-up period post-surgery was 2.9 years. Return to sport outcomes were compared between arthroscopic and open surgery using a Kaplan–Meier survival analysis. Logistic regression modelling was used to determine associations between injury recurrence, type of injury, participant age and method of surgery.
Results: Shoulder instability injuries occurred most frequently during tackling (40%). Arthroscopic surgery was preferred for primary shoulder instability. Nine (16%) recurrences occurred in those who underwent arthroscopic surgery compared to two (9%) following open surgery. Return to the elite level was slightly but significantly (2 weeks, $p = 0.049$) longer for open compared to arthroscopic surgery. Recurrence was 5 times more likely if the primary injury was a dislocation and more likely in players who were younger at the time of surgery.
Conclusion: Tackling was the predominant mechanism for shoulder instability injuries in AFL players and arthroscopic surgery was more commonly performed for primary injuries. Sustaining a dislocation as the primary injury and younger age increased the likelihood of recurrent instability. Careful consideration should be given to the operative management of these individuals.

1. Introduction

Shoulder instability (SI) injuries involve excessive translation of the humeral head relative to the glenoid resulting in subluxation or dislocation.[1] SI is common in high-contact collision sports such as rugby, American Football and Australian Rules Football (ARF).[2–4] ARF is a fast-paced, highly-physical overhead contact sport that involves regular collisions and tackling.[5] The Australian Football League (AFL) is the premier ARF competition in Australia. The AFL maintains a publicly available injury surveillance report and groups SI injuries within a group of injuries collectively as "shoulder sprains and dislocations".[4] These injuries are the most common upper limb injury in AFL players and in 2015 players were unavailable to play matches due to shoulder sprains and dislocations for an average of 11.5 games per season for each AFL club.[6]

In AFL players, there is little evidence to guide clinical decision making for operative management of SI. In the only study to date, Roberts et al.[7] compared the outcomes of an open surgical technique (OT) to an arthroscopic technique (AT) in 56 ARF players, most of whom played at an amateur-league level, and reported recurrent

* Corresponding author.
E-mail address: jason.bonacci@deakin.edu.au (J. Bonacci).

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instability in 30% of players who underwent OT versus 78% who had AT suture repair and 38% who had AT using an absorbable polyglyconate tack. For current clinicians there is little to draw from this study due to the vast changes in AT since 1999[8]. Further, this data was merely descriptive and did not investigate factors that may have contributed to recurrence of injury. Given the prevalence and impact of SI injuries in AFL players there is a need to understand current operative management of traumatic SI and subsequent outcomes in this setting to better inform clinical decision-making.

The primary aims of this study were to: (1) determine the mechanism of SI injuries and frequency of OT and AT being used to manage these injuries in professional AFL players; and (2) determine the return to sport time and the rate of post-operative injury recurrence for OT and AT. The secondary purpose of this study was to examine the factors that contribute to post-operative injury recurrence.

2. Methods

This study used a retrospective cohort design. Participants were elite AFL listed players with SI that underwent primary surgical treatment between 2009 and 2013. SI was defined as gleno-humeral instability that underwent stabilisation surgery, irrespective of the mechanism or extent of instability (i.e. dislocation or subluxation). An AFL listed player is a professional athlete who is registered to play with an AFL club. The study was approved by the Deakin University Human Ethics Advisory Group and the AFL Research Board and written informed consent obtained from participants.

Data pertaining to the SI injury and treatment were extracted from the AFL club's medical records by the club's medical officer or physiotherapist to a proforma. Variables of interest included the date, location and mechanism of initial injury, surgical management, return to sport date and details of any injury recurrence. All participants were followed up for injury recurrence until the end of the 2014 calendar year.

Initial injury was defined as the primary shoulder instability event that resulted in surgical management. Date of the injury, participant age at the time of injury, height, location at the time of injury (i.e. training, match), mechanism of injury and the type of instability event (i.e. dislocation or subluxation) were all obtained from medical records. In the case that a participant had multiple instability events without a known primary injury event these were coded as an unknown mechanism and date of injury. Date of surgery, participant age at the time of surgery and type of surgery performed (open or arthroscopic technique) were obtained from Club medical records or operation notes. Time to return to first match at any level and time to return to an AFL level match were obtained. An AFL match included the pre-season AFL competition. Recurrence was defined as a player experiencing post-surgical SI to the operated shoulder that subsequently underwent another operation during the study period. When recurrence occurred, the type of recurrent instability event, date of injury, mechanism of injury, time to recurrence from the initial surgery, and the subsequent management (i.e. AT or OT) were obtained from club medical records or operation notes.

Statistical analyses were completed using Stata (Version 14, Stata Corp. College, Texas, USA). Descriptive statistics were used for participant characteristics, injury mechanism, surgical procedure rates, injury recurrence rates, and RTS rates. Kaplan–Meier curves and log rank tests were used to determine if there were differences between AT and OT with respect to: (i) time to return to first match at any level; (ii) time to return to an AFL level match and (iii) time to injury recurrence. Data for participants who did not RTS within the follow-up period were treated as censored in the Kaplan–Meier curves. A Wilcoxon rank sum test was performed to determine if there was a difference in RTS time between those who had a recurrence and those who did not. Logistic regression modelling was used to determine if there were associations between injury recurrence and the type of injury (dislocation or subluxation), participant age at the time of injury and at surgery, the type of surgery (AT or OT) and time (weeks) between injury and the surgery. A sensitivity analysis of the association between injury recurrence and type of injury, age at surgery and type of surgery was also performed by removing any participants from the analysis whose follow-up time post-surgery was less than 22 months. Statistical significance was set at an alpha level of 0.05 for all tests. All data are presented as mean (SD) unless otherwise indicated.

3. Results

Seventy-seven SI injuries from 72 participants were recorded (5 had bilateral SI). The mean age and height of participants was 21.9 (3.1) years and 1.88 (0.07) m, respectively. Tackling was the predominant injury mechanism for primary traumatic SI injuries (Fig. 1). The primary instability event was more often subluxation (53 injuries; 68.8%) than dislocation (24 injuries; 31.2%). All dislocations were in the anterior or anterior-inferior direction. SI injuries occurred during a match (87.0%), training (11.7%), and playing other sports (1.3%).

Fifty-five (71.4%) SI injuries were treated using AT, of which 15 (27.3%) were dislocation injuries. Twenty-two (28.6%) SI injuries were treated using OT, of which 9 (40.9%) were dislocation injuries. All OT were primary procedures for SI. There was no significant difference in the proportion of subluxation or dislocations that were treated with AT or OT (OR = 1.85, 95% CI: 0 .57 to 5.82), $\chi^2(1, N = 77) = 1.36$, $p = 0.243$. Twelve of the OT (54.5%) used a bone block procedure, of which 11 used the Latarjet technique. Nine of the 11 (81.8%) shoulders that underwent a second operation for recurrence had an OT procedure, of which 7 used the Latarjet technique. The mean time between the initial injury and surgery was 12.4 (18.9) weeks, ranging from 0.6–119.4 weeks. The majority of surgeries (71%) occurred toward or at the end of the AFL season. Participants were followed-up post-surgery for injury recurrence for a mean (range) of 2.9 (0.8–5.6) years.

Most participants (92%) returned to ARF matches at any level post-surgery with the exception of 5 participants who were delisted from their club and 1 player who did not have RTS recorded. 89% of participants returned to play at their pre-injury level (AFL). The mean time to return to first match and to an AFL match post-surgery was 27.1 (9.1) and 29.3 (12.8) weeks, respectively. Return to AFL level was significantly longer for participants who underwent OT compared to AT (median = 26 weeks vs. 24 weeks respectively, $p = 0.049$). Return to any match was not significantly different between OT and AT (median = 24.5 vs. 24.2 weeks respectively, $p = 0.80$).

Eleven (22.5%) recurrences were recorded. Subluxations and dislocations accounted for 5 and 6 of these injuries, respectively. The mechanism of these injuries were: a fall during a match (4, 36%); contact during a contested ball situation (3, 27%); tackling (2, 18%) and 2 injury mechanisms were not recorded. Median (range) time to recurrence was 46 (23–206) weeks. There was no significant difference in time to recurrence between AT or OT (median = 37 vs. 55 weeks respectively, $p = 0.41$, Fig. 2). Time to return to an AFL match was not different between those who had a recurrence of injury and those who did not (median = 27.4 vs. 24.1 weeks respectively, $p = 0.21$).

The odds of recurrence was 5 times greater in players whose primary injury was dislocation compared to subluxation (Table 1).

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