Hand fractures and return to play in elite Australian cricketers

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ABSTRACT

Introduction: Hand fractures are one of the most common injuries sustained whilst playing cricket. Further research is required to inform future clinical management and risk-reduction strategies.

Methods: This retrospective cohort study reviewed all cases of hand fractures in elite Australian cricket players over a three-year period. Data included specific activity when injury occurred, location of injury, management (non-surgical or surgical) and days to return to play.

Results: Seventy (17%, 95% CI 14–21 of players; 43 male, 27 female) players sustained 90 hand fractures. Seventy-three (81%, 95% CI 72–89) fractures occurred whilst fielding the ball. Eighty-four (93%, 95% CI 86–97) fractures occurred to the ‘exterior’ bones of the hand: distal phalanx, middle phalanx, first and fifth rays. Thirteen (14%, 95% CI 9–23) fractures were managed with surgical internal fixation, of which 11 were to the phalanges, most commonly at the proximal phalanx ($n = 5$, 36% of all proximal phalanx fractures) or fifth ray middle and proximal phalanges ($n = 5$, 42% of all fifth ray phalangeal fractures). Fractures requiring surgical management typically had longer time injured (median 33 days, IQR 27–41) than fractures managed non-surgically (median 6 days, IQR 0–21) ($p = 0.001$). Total time to return to full unrestricted play was similar between surgical (49 days, IQR 45–52) and non-surgical (32 days, IQR 15–45) management ($p = 0.197$).

Conclusions: Hand fractures sustained by elite male and female Australian cricket players were found to display a pattern of occurring to the ‘exterior’ bones of the hand. The results of this study may inform clinical decision making with respect to non-surgical or surgical management and anticipated return to play times. Further effort is needed to address risk reduction strategies including gloves and skill proficiency.

1. Introduction

Hand and wrist injuries are one of the most common injuries in cricket, estimated to account for approximately 11–13% of all injuries, regardless of gender, age, format and level of competition.^{1,2} These injuries often result in a player being unable to play for multiple weeks.^{1,3} Hand injuries are most commonly a result of direct impact or collision with either the ball or the ground whilst fielding.¹ Injuries, including fractures, have been described to typically occur to the fingers,^{1,4} particularly the little and ring finger.^{1,5} Fractures of the fingers do not commonly require surgical fixation.⁶

Protective equipment for hand and wrist injuries includes batting and wicket keeping gloves. In training, players may also opt to wear gloves during fielding drills. Gloves are perceived to reduce the risk of hand fractures and other injuries, however design and quality vary and the efficacy is unknown.^{7,8} There is an opportunity to improve gloves and other risk reduction strategies with increased understanding of how

injuries occur and the location of injuries.

Research to-date has highlighted the burden of hand and wrist injuries in cricket, however more detailed insight is needed to inform clinical decision making. This study aims to contribute to this gap in knowledge with a specific focus on hand fractures in elite Australian cricket players.

2. Material and methods

2.1. Database

Data was retrieved from Cricket Australia's online Athlete Management System (Fair Play Pty Ltd). Data in the Athlete Management System is recorded in a standardised manner by medical staff (Doctor and/or Physiotherapist) working with state/territory and national cricket teams. Ethics approval was gained from an Institutional Ethics Committee which waived the need for individual consent (La

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2.2. Study population

Elite Australian male and female cricket players who sustained a hand fracture (including avulsion fracture) during the 3-year period December 2015–December 2018.

2.3. Outcomes

A comprehensive review of medical notes was conducted to determine: activity when injury occurred, location of injury, management, and return to play defined as follows. Activity when the injury occurred consisted of setting (training or match), and position at the time (batter, wicket keeper, fielder, bowler). Match fielding positions were broadly grouped as infield (within the inner circle measured at 27.4 m from the wicket for males, 23 m for females) or outfield (up to 82.3 m for males, 64.0 m for females). Location of injury refers to the specific bone fractured. Bones were grouped by 'ray' which refers to the phalanges and the metacarpals. Management was either non-surgical or surgery (internal fixation).

Return to play was classified in two ways: 1) days injured, when the player was unable to participate in any cricket training or match activity, and; 2) days to return to full unrestricted cricket training or match play. These classifications were deemed to have the greatest utility for clinical decision making, noting return to training or match play may be misleading as the player may still be injured but able to train or play with modification (e.g., train but avoid certain fielding drills, play in limited fielding positions).

2.4. Data analysis

Descriptive statistics are reported for all variables with 5 or more cases. Proportions were calculated with a Wilson 95% confidence interval (CI). Fisher's exact test was used to compare injury rates between males and females and activity grouped by use of gloves: batting, wicket keeping, fielding/bowling.

3. Results

A total of 70 (17% of players; 43 male, 27 female) elite Australian cricketers sustained 90 hand fractures between December 2015 and December 2018 (Fig. 1). The mean age at time of injury was 26.7 ± 5.4 years for males and 25.4 ± 4.5 years for females. Fractures occurred during matches (61%; international $n = 9$, domestic $n = 25$, club $n = 11$) or training (39%).

The observed rate of hand fractures during matches (for which the denominator of total balls batted/fielded is known) was highest for the fielding team ($p < 0.001$ compared to batting team) (Table 1). In the field, females had a higher rate of hand fractures than males ($p = 0.002$).

Seventy-three (81%, 95% CI 72-89) fractures occurred whilst fielding the ball (i.e. catching or diving) including bowlers (n = 14) and wicket keepers (n = 10) in both matches and training. Eighty percent of the fractures sustained by fielders occurred in the infield (a central oval on the cricket field, the reference point for fielding restrictions, in contrast to the more distant outfield). Eight (9%, 95% CI 4-17) fractures occurred whilst batting. Forty-eight injuries (53%) occurred to the dominant hand for the specific skill during which the injury occurred (throwing or bowling arm, or lower hand when batting).

Eighty-four (93%, 95% CI 86-97) fractures occurred to the 'exterior' bones of the hand: distal phalanx, middle phalanx, first and fifth rays (Fig. 2). This was consistent across playing positions grouped by use of gloves (90-100%, all $p > 0.4$). Wicket keepers had a higher proportion of middle phalanx to distal phalanx fractures (67%, 95% CI 35-88)

Fig. 1. Number of fractures by bone.

Table 1
Observed rate of hand fractures during matches by position and gender.

	Hand fractures per 100,000 balls per team	Hand fractures per 100,000 balls per player
All players (13 exposed per ball)	4.98	0.38
Male players	3.87	0.30
Female players	9.67	0.74
All batters (2 exposed per ball)	1.48	0.74
Male batters	1.37	0.69
Female batters	1.95	0.97
All fielders (excluding wicket keeper, 10 exposed per ball)	6.61	0.66
Male fielders	4.77	0.48
Female fielders	14.42	1.44
All wicket keepers (1 exposed per ball)	1.84	1.84
Male wicket keepers	1.59	1.59
Female wicket keepers	2.88	2.88

compared to batters (9%, 95% CI 2-38) ($p = 0.017$) and fielders/bowlers (30%, 95% CI 18-44) ($p = 0.055$). There were a total of 19 avulsion fractures.

Seventy-seven (86%, 95% CI 77-92) fractures were managed non-surgically, including all avulsion fractures and less than five cases which required minimally-invasive procedures, such as surgical washout or removal of a small fragment only. Thirteen (14%, 95% CI 9-23) fractures were managed with surgery, all requiring internal fixation. Of these 13 surgically managed fractures, 11 were to the phalanges, most commonly at the proximal phalanx (n = 5, 36% of all proximal phalanx fractures) or fifth ray middle and proximal phalanges (n = 5, 42% of all fifth ray phalangeal fractures).

Fractures requiring surgical management typically had longer time

Fig. 2. Illustration of the 'exterior' bones of the hand.

injured (median 33 days, IQR 27–41) than fractures managed non-surgically (median 6 days, IQR 0–21) ($p = 0.001$) (Fig. 3). Total time to return to full unrestricted play was similar between surgical (49 days, IQR 45–52) and non-surgical (32 days, IQR 15–45) management ($p = 0.197$) (Fig. 4).

4. Discussion

Hand fractures sustained by elite male and female Australian cricket players were found to display a pattern of occurring to the 'exterior' bones of the hand. This pattern was consistent regardless of playing activity and use of gloves. The exterior bones are more vulnerable to impact from a ball and hence this pattern may be characteristic of other

ball and projectile sports.⁹ With sports such as rugby and ice skating where hand fractures often result from falling on a hard surface may show a different pattern of fractures, specifically to the 'internal' bones of the hand.⁹

Surgical management was required in approximately one in seven cases. This rate is consistent with that reported by Ahearn et al. in a cohort of professional county cricketers.¹ Fractures managed surgically resulted in more days injured with no activity, likely attributable to post-surgical wound care and implant restrictions. Interestingly, the time to return to full unrestricted training or match play was similar between surgical and non-surgical management, which may reflect the expected healing time of bone.¹⁰ This finding appears to differ from the longer duration noted for surgically managed fractures by Ahearn et al. however complete statistics were not provided to confirm.¹

Hand fractures were most frequently sustained when fielding the ball. It is not possible to compare the relative risk between matches and training as the number of balls fielded at training is unknown. Nevertheless, approximately eight fractures per year is a considerable injury burden which warrants attention. Risk reduction strategies which may be used when fielding in training but not matches include reducing the exposure (quantity of balls fielded), using gloves, or a softer ball. Players may wear gloves when fielding at training, however the current gloves are not designed to protect the exterior bones from fracture (Fig. 5). There is potential to improve the design of fielding gloves to reduce the risk of hand fractures.

An alternative risk reduction strategy is to improve skill proficiency. This strategy may be particularly applicable to female players who had a higher rate of hand fractures relative to balls fielded in matches compared to males. It has been suggested that increased fielding practice may have the potential to reduce the number of hand injuries in general.^{3,11}

The rate of hand fractures was significantly reduced for players when wicket keeping or batting with gloves. This suggests that gloves are somewhat effective as a risk reduction strategy, however, as fractures are still occurring there is potential for improvement. Wicket keeping gloves include specific protection of the distal phalanges. This may explain why more fractures were observed at the middle phalanges rather than the distal phalanges. Therefore, the design of wicket keeping gloves should aim to better protect all exterior bones of the hand including the middle phalanges.

When interpreting the findings of this retrospective descriptive study, readers should be aware of the robustness of the variables presented. Data relating to the individual (gender, age, handedness) and

Fig. 3. Days injured (unable to participate in any activity) by bone and management. MC = metacarpal, PP = proximal phalanx, MP = middle phalanx, DP = distal phalanx.

Fig. 4. Days to return to full unrestricted activity by bone and management. MC = metacarpal, PP = proximal phalanx, MP = middle phalanx, DP = distal phalanx.

Fig. 5. Gloves used for fielding drills in training. Note 'exterior' bones of the hand are largely unprotected.

injury (bone, activity, management) are certain. Fielding position data was less reliably noted on clinical notes (73% complete) so is included for interest only. Days injured and days to return to full unrestricted activity are accurate, however may have been influenced by other factors independent of the hand fracture.

5. Conclusions

Hand fractures sustained by elite male and female Australian cricket players were found to display a pattern of occurring to the 'exterior' bones of the hand. Compared to non-surgically managed fractures, surgically managed fractures typically had a longer time injured but a similar time to return to full unrestricted play. The results of this study may inform clinical decision making with respect to non-surgical or

surgical management and anticipated return to play times. Further effort is needed to address risk reduction strategies including gloves and skill proficiency.

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References

1. Ahearn N, Bhatia R, Griffin S. Hand and wrist injuries in professional county cricket. *Hand Surg.* 2015;20(1):89–92.
2. Orchard J, James T, Alcott E, Carter S, Farhart P. Injuries in Australian cricket at first class level 1995/1996 to 2000/2001. *Br J Sports Med.* 2002;36(4):270–274.
3. Warren A, Dale S, McCaig S, Ranson C. Injury profiles in elite women's T20 cricket. *J Sci Med Sport.* 2019;22(7):775–779.
4. Stretch RA. Cricket injuries: a longitudinal study of the nature of injuries to South African cricketers. *Br J Sports Med.* 2003;37(3):250–253.
5. Belliappa P, Barton N. Hand injuries in cricketers. *J Hand Surg.* 1991;16(2):212–214.
6. Orchard J, Down S, James T, et al. Surgeries performed in professional Australian male cricketers. *J Sports Med NZ.* 2015;7.
7. Finch CF, Elliott BC, McGrath AC. Measures to prevent cricket injuries. *Sports Med.* 1999;28(4):263–272.
8. Stretch RA. Protective sports equipment for reducing injuries in cricket. *Int Sportmed J (ISMJ).* 2006;7(4):231–237.
9. Aitken S, Court-Brown CM. The epidemiology of sports-related fractures of the hand. *Injury.* 2008;39(12):1377–1383.
10. McCue III FC, Hugh Baugher W, Kulund DN, Gieck JH. Hand and wrist injuries in the athlete. *Am J Sports Med.* 1979;7(5):275–286.
11. Perera NKP, Joseph C, Kemp JL, Finch CF. Epidemiology of injuries in women playing competitive team bat-or-stick sports: a systematic review and a meta-analysis. *Sports Med.* 2018;48(3):617–640.