Scrum Injury Risk in English Professional Rugby Union

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Objective: To assess and evaluate the injury risk associated with the scrum in English professional rugby union in the 2011-2012 season.

Design: Prospective, cohort.

Participants: Players at English Premiership rugby union clubs

Outcome measures: Frequency of team scrum-events per match; incidence (injuries per 1000 player hours; propensity (injuries per 1000 events); risk (days absence per 1000 player hours and days absence per 1000 events).

Results: 31% of scrums in competitive matches resulted in collapse. Injury incidence associated with collapsed scrum-events (incidence: 8.1 injuries/1000 scrum-events) was significantly higher than those scrums that did not collapse (incidence: 4.1/1000 scrum-events).

Conclusions: The injury risk associated with collapsed scrum supports the continued focus on reducing scrum collapse through changes in, and strict application of, the laws surrounding the scrum.

Introduction

Rugby union is a contact team sport and, in line with other contact sports, there is a substantial risk of injury.[1] Targeted injury prevention should be informed by an understanding of injury risk in the context of the game events that are associated with injury. Recent years have seen a concentrated focus on the safety of certain contact elements of rugby, specifically the scrum and the tackle.[2]

The stated purpose of the scrum is to restart play quickly, safely and fairly, after a minor infringement or stoppage.[3] However, in Rugby World Cup 2011 only 53% of primary scrums resulted in clean ball [4] and up to 59% of all scrums in northern-hemisphere international rugby result in collapse.[5]

In the context of injury risk, 11% of injuries to forwards in elite rugby union have been associated with scrummaging, with an incidence of 10 per1000 player-hours.[1] This incidence is lower than that for other contact events such as the tackle when referenced to hours of player match exposure, but when expressed as injury incidence per event (propensity), scrum injuries are more common than injuries associated with any other match contact event at 8.1 injuries/1000 scrum-events.[2] Intuitively, collapsed scrums are likely to be associated with a greater injury risk than scrums that do not collapse; however, in the professional game in England (2003-2006), propensity of injury associated with collapsed scrums was less than half that for scrums that did not collapse.[2] Although rare, there has been a particular focus on the risk of catastrophic spinal injury in relation to the scrum,[6,7] with 46% of catastrophic injuries associated with collapse and 47% with the initial engagement.[6]

The paucity of studies reporting on non-catastrophic injuries associated with the scrum and scrum collapse since Fuller et al.[2], the change in the scrum law in 2007,[8] and the increased proportion of scrums that collapse at elite level,[4,5] indicate that it is worth revisiting this issue. Furthermore, since the scrum is a set piece, the injury risk associated with the scrum could be considered more "controllable" than the injury risk associated with tackle, ruck and maul events.[4] The aim of this study was therefore to investigate the incidence and risk of injury sustained during scrummaging, with a particular focus on scrums that result in collapse.

Methods

This was a prospective, cohort study of injury risk in the scrum in 240 competitive matches played by the 12 English Premiership clubs in the 2011-2012 season and is part of the English Professional Rugby Injury Surveillance Project.[9] All injury definitions are compliant with the International Rugby Board consensus statement for epidemiological studies in rugby.[10] Institutional ethical approval and informed consent was obtained for the study.[9]

Details of any injury resulting in more than one day absence from training and match play (time-loss injury), including the associated match event, were recorded by club medical teams during all competitive first team matches. Match exposure was calculated as the number of games played by each team multiplied by 8 players (Forwards). All match scrum events were identified and categorised from commercial quality match video footage (PGIR Ltd, Corsham, UK). Scrum events were classified as: first-set scrum, not collapsed; first-set scrum, collapsed; re-set scrum, not collapsed; re-set scrum, collapsed. Scrum events were calculated as the number of events a team engaged in per match (team scrum-event), since matches in the European and Anglo-Welsh competitions were played against teams not included in this study and hence injury data are not available for these teams.

Frequency of specific scrum events is presented as number of team scrum-events/match. Injury incidence is presented as injuries/1000 player-hours, propensity as injuries/1000 events, and severity as mean days absence. Injury risk is presented as total days absence/1000 player-hours and injury risk per team scrum-event as total days absence/1000 events. Confidence intervals of 95% (95% CI) are presented for each variable. Data were analysed using Welch's t-test for samples with unequal variance (QuickCalcs, GraphPad Software Inc., USA) with significance accepted at $P<0.05$. Risk ratios were calculated as described by Kirkwood and Sterne [11].

Results

There were 7475 team scrum-events in 397 team-games (240 matches) and 4235 player-hours (forwards) of match exposure included in the study. Data were not available for two matches (one in the Anglo-Welsh Cup competition and one in the European Cup competition) and therefore were not included in the analyses. The frequency of team scrum-events per match is summarised in table 1. Collapsed scrums accounted for 31% of all scrums.

Table 1. The frequency of team scrum-events per match

Scrum event type (No. of team scrum-events)	**Frequency of team-events per match** (95% CI)
First-set scrum, not collapsed (n=3860)	9.7 (9.4-10.0)
Re-set scrum, not collapsed (n=1284)	3.2 (3.0-3.4)
ALL Scrums - not collapsed *(n=5144)*	13.0 (12.7-13.4)
First-set scrum, collapsed (n=1708)	4.3 (4.1-4.5)
Re-set scrum, collapsed (n=623)	1.6 (1.5-1.7)
ALL Scrums - collapsed *(n=2331)*	5.9 (5.7-6.1)
All Scrums (n=7475)	18.8 (18.4-19.2)

Forty-one reported injuries were associated with scrum events. No catastrophic spinal-cord injuries were reported. The propensity of injury associated with collapsed scrums (8.6/1000 scrum-events) was significantly higher (P=0.04) than scrums that did not collapse (4.1/1000 scrum-events), with a risk ratio of 2.10 (95% CI: 1.14-3.87). Risk per event was greater for collapsed scrums (269 days/1000 scrum-events) than scrums that did not collapse (145 days/1000 scrum-events), and although this was not significant (P=0.08), the risk ratio was 1.86 (95% CI: 1.01-3.43) The incidence, propensity, severity and risk of injury associated with scrum events is summarised in table 2.

Table 2. Incidence, propensity, severity and risk of injury associated with scrum events

	Incidence/propensity of Injury		**Severity of Injury**	**Risk of Injury**	
Scrum event type (No. of Injuries)	Injuries/1000 player-hours (95% CI)	Injuries/1000 team scrum-events (95% CI)	Days (95% CI)	Days lost/1000 player-hours (95% CI)	Days lost /1000 team scrum-events (95% CI)
First-set scrum, not collapsed (n=18)	4.3 (2.7-6.8)	4.7 (3.0-7.5)	36.7 (8.5-64.9)	156 (98-248)	171 (108-272)
Re-set scrum, not collapsed (n=3)	0.7 (0.2-2.2)	2.3 (0.7 - 7.1)	28.0 (16.1-39.9)	20 (6-61)	65 (21-203)
ALL Scrums - not collapsed *(n=21)*	*5.0 (3.3-7.7)*	*4.1 (2.7-6.3)*	*35.5 (11.3-59.7)*	*176 (115-270)*	*145 (94-222)*
First-set scrum, collapsed (n=13)	3.1 (1.8-5.3)	7.6 (4.4-13.1)	26.0 (9.0-43.0)	80 (46-137)	198 (115-341)
Re-set scrum, collapsed (n=7)	1.7 (0.8-3.6)	11.2 (5.3-23.5)	41.3 (-3.2-85.8)	68 (33-143)	464 (221-973)
ALL Scrums - collapsed *(n=20)*	*4.7 (3.0-7.3)*	*8.6 (5.6-13.3)*	*31.4 (12.8-50.0)*	*148 (96-230)*	*269 (174-417)*
All Scrums (n=41)	9.7 (7.1-13.2)	5.5 (4.0-7.5)	33.5 (18.3-48.7)	324 (239-440)	184 (135-249)
t-test, p value. ALL Scrums not collapsed v collapsed		P = 0.04			P = 0.08

Thirty-six (88%) of the 41 reported scrum injuries were sustained by front row forwards. Of these, 16 were sustained by tight-head props, 11 by loose-head props, 3 by props (position not specified) and 6 by hookers. Ten of the sixteen injuries in tight-head props and five of the six injuries to hookers were associated with scrums that did not collapse, whereas ten of the eleven injuries to loose-head props were associated with collapsed scrums.

Discussion

We investigated injuries associated with rugby scrummaging, with a particular focus on scrums that collapse. The main finding was that in professional English rugby union the propensity for injury associated with collapsed scrums was significantly greater than for scrums that did not collapse.

The frequency of scrums was 18.8 per match, which is lower than the 28.9 per match in 2003-2006.[2] These findings are similar to the decrease observed in northern hemisphere international tournaments 2005-2012 (from 20 to 14).[5] In the present study, the frequency of collapsed scrums (5.9 per match) was similar to the 2003-2006 study data (5.0 per match),[2] meaning the proportion of scrums resulting in collapse is higher in this study (31% vs. 17%). While not as high as the ~50% in international rugby,[5] these data reinforce the widely held belief that a concerted effort should be made to reduce the proportion of scrums that collapse in professional rugby.

An injury incidence of 9.7/1000 player-hours associated with all scrum events is consistent with data from Brooks et al (10/1000 player-hours) and Fuller et al. (11.0/1000 player-hours)[1,2] The propensity of injury associated with the scrum was slightly higher in the present study (5.5 injuries/1000 events) than that of Fuller and colleagues (4.1 injuries/1000 events),[2] but small differences in the method of propensity calculation means that the summary data of Fuller and colleagues have been recalculated here, and direct statistical comparison is not appropriate. Similarly, when the data of Fuller and colleagues are recalculated for comparison, the risk of injury expressed per event was greater in the present study (184 vs. 108 days absence/1000 events).[2]

The main finding of this study is that propensity of injury associated with collapsed scrums was greater than scrums that did not collapse (8.6 vs. 4.1 injuries/1000 events). Injury risk per event was also greater for collapsed scrums than scrums that did not collapse (269 vs. 145 days absence/1000 events), although this was not significantly different. It should be noted that the severity of injuries associated with scrums that did or did not collapse was not different, and therefore any increased risk in collapsed scrums is a function of greater propensity. Although based on a relatively small number of injuries in a single season, these data provide initial evidence to support continued player welfare initiatives to reduce scrum collapse. and the number of scrums that are re-set. A further consideration is that the time-loss injury definition employed in this study may underestimate cumulative injury risk associated with repeated scrummaging and the effect of repeated collapses.

These data confirm front row forwards are at the greatest risk of injuries associated with the scrum event.[6,12] Loose-head props appeared to sustain proportionally more injuries associated with the collapsed scrum than with scrums that did not collapse. Whether these findings reflect a genuinely higher risk for these players in scrums that collapse needs further investigation.

Scrums that collapse are more likely to result in injury than those that do not. Given the set piece nature of the scrum it might be argued that injury risk should be to some extent "controllable", when compared to the more "uncontrollable" events in matches, such as the tackle. These findings support continued coach, player and referee education on injury risk associated with collapsed scrums. Furthermore, studies reporting on the specific injuries sustained during the scrum and collapsed scrum will assist in injury prevention strategies, whilst continued attention should focus on reducing scrum collapse through changes in, and strict application of, the laws surrounding the scrum.

Competing Interest: none

Ethical approval: University of Bath

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