



Original Research

Recurrent injury patterns in adolescent rugby

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ABSTRACT

Objectives: To establish patterns of subsequent injury in U18 rugby, to quantify the burden of within season injury recurrence.

Design: Secondary analysis of prospective data.

Setting: 28 Schools in Ireland.

Participants: 825 male rugby players (aged 15–18 years).

Main outcome measures: Subsequent injuries were classified as: new, local or recurrent (same site and type as index injury). All recurrent injuries were sub-grouped by body part and diagnosis. Burden was based on frequency, days lost and injury proportion ratios.

Results: A total of 426 injuries were eligible for analysis, of which, 121 were subsequent injuries. The majority of subsequent injuries involved a different body part than their index injury. There were $n = 23$ cases of within season recurrence. 78% of recurrences occurred within 2 months of return to play. Recurrent injuries comprised 5% of all injuries and their cumulative time loss was 1073 days. Recurrent injury to the ankle ligaments, lumbar muscles and concussions carried the greatest burden.

Conclusion: The burden of recurrent injury in U18 rugby is lower than in the professional game.

However, this population could benefit from targeted secondary prevention efforts including reconsideration of return-to-play protocols for ankle sprain, lumbar muscles and potentially concussion.

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1. Introduction

Rugby Union is the third most common contact sport in the world. It is played by over 2.5 million people in the UK and Ireland, with over 700,000 registered teenage players (Freitag, Kirkwood, Scharer, Ofori-Asenso, & Pollock, 2015). Rugby Union is a fast paced, collision sport and therefore carries a high risk of injury. A recent meta-analysis of professional rugby estimated an injury incidence of 81 per 1000 player hours (Williams, Trewartha, Kemp, & Stokes, 2013). Recently more epidemiological data has become available from adolescent players, with meta-analyses suggesting

an incidence rate of 26.7 per 1000 player hours (Bleakley, Tully, & O'Connor, 2011; Freitag et al., 2015). Although these figures are lower than in professional populations, there are similarities in injury pattern with both adolescent and elite cohorts at highest risk of head, shoulder and knee injuries, particularly during the tackle situation (Archbold et al., 2017; Whitehouse, Orr, Fitzgerald, Harries, & McLellan, 2016).

Sports injuries are often recurrent and there is much evidence that a subsequent injury is associated with a previous injury (Hagglund, Walden, & Ekstrand, 2006; Meeuwisse, Tyreman, Hagel, & Emery, 2007). Subsequent injuries are often classified as (Freitag et al., 2015) New: different site (Williams et al., 2013); Local: same site (and different type); or (Bleakley et al., 2011) Recurrent: same site and type (Hamilton, Meeuwisse, Emery, & Shrier, 2011). An eight season prospective study in elite rugby union in Australia found that 70% of subsequent injuries were 'new' injuries, with 14% classified as local and 16% recurrent (Williams et al., 2017).

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Interestingly, the majority of recurrent injuries involved the ankle and neck regions, and many occurred early, within 2 months of returning to play (Williams et al., 2017). Patterns of subsequent injury have not yet been extensively evaluated in adolescent Rugby Union players. A recent systematic review of rugby injuries in players aged <21 years did not report data on subsequent injuries (Freitag et al., 2015). However, a preliminary report (Palmer-Green et al., 2013) from 7 schools in England suggested that 11% of rugby injuries occurring within a single season are recurrent, and that these injuries are associated with greatest time loss.

High levels of recurrence increase the immediate burden of sports injury but may also have a deleterious impact on long term health. A key concern is that adolescent rugby players are at particular risk of subsequent and recurrent injury due to the limited access to professional medical care. The purpose of this research was to establish patterns of subsequent injury in adolescent rugby union. Our primary objectives were to quantify the burden of within season injury recurrence and to subgroup based on body part and diagnosis.

2. Methods

This is a secondary analysis of prospectively collected epidemiological data from the RISUS study (Rugby Injury Surveillance in Ulster Schools) (Archbold et al., 2017). Ethical approval was obtained through the X Ethics Committee (REC/14/0060) and individual consent was obtained from participants and their guardians. The study methods have been described in full detail elsewhere (Archbold et al., 2017). Briefly, eligible teams were those participating in a provincial schools' cup competition. Individual participants must have been members of their schools' first team squad. In total, 825 players, from 28 schools, were included over a single season. The average number of players recruited from each school was 27 (SD 6.3). All participants were male with mean age of 16.9 years (SD 0.8; range 15–18y), mean weight of 78.8 kg (SD 12.3) and mean height of 1.78 m (SD 0.07).

2.1. Data collection and definitions

The following information was inputted for each injury: the date of injury, classification of the injury at two levels (body site, type of injury), information on the injury event, and the date of return from injury. Injury reporting was completed each week by a designated person at each school (data champion), directly onto an online data system. All definitions and procedures used in the study aligned with the international consensus statement on injury surveillance studies for rugby (Fuller et al., 2007). The primary injury definition used was for time-loss injuries, which was defined as 'any injury that prevents a player from taking a full part in all training and match play activities typically planned for that day for a period of greater than 24 h from midnight at the end of the day the injury was sustained'. Injury severity was based on the total number of days elapsed from the day of injury until a player returned to full fitness, with full fitness being defined as 'the player being able to take a full part in training activities typically planned for that day and available for match selection'. Injury severity was classified according to the following subgroups: minor (1–7 days), moderate (8–28 days) and severe injury (>28 days).

2.2. Analysis

Over a single playing season, the RISUS study prospectively recorded 426 injuries. For this post hoc analysis, players' injuries were ordered sequentially according to the date of their occurrence to determine the first index injury and any subsequent injuries

(Finch & Cook, 2014). Subsequent injury was defined to have occurred in the subset of players with two or more reported injuries in the 2014/15 playing season. When players sustained two injuries, the first chronological injury was taken as the index injury. When players suffered multiple injuries (>2) within the same season, each injury was examined and if applicable, players were assigned additional unique index injuries. All subsequent injuries were then labelled according to body part and diagnosis before being categorised into one of the following categories: new (involving a different body region to the index injury); local (involving the same body region as the index injury, but with a different diagnosis); or recurrent (involving the same body region AND diagnosis as the index injury). (Hamilton et al., 2011).

Our primary analyses were on those subsequent injuries categorised as 'recurrent'. Time to recurrence was summarised and plotted using a survival curve. Time to recurrence was also dichotomised to facilitate comparisons to previous research, whereby recurrent injuries occurring within 2 months after return to full participation from the index injury were defined as 'early' and >2 months as 'delayed' (Williams et al., 2017). Recurrent injuries were also sub-grouped according body part and diagnosis. Burden was reported as the number and proportion of total injury days lost due to recurrent injury.

Wilcoxon Signed-Ranks Test and calculation of effect size was used to compare the time loss associated with recurrent injuries vs index injuries. For each recurrent injury, we calculated separate injury proportion ratios (IPR); this compared the proportion of recurrent injuries that were 'eg. concussions' and the proportion of new injuries that were concussions. Below is an example of how IPRs were calculated (Welton et al., 2018):

$$\text{IPR} = \frac{\text{number of recurrent concussions}}{\text{number of recurrent injuries}}$$

$$\frac{\text{number of new concussions}}{\text{number of new injuries}}$$

All statistical analyses with SPSS software (V.22.0; SPSS, Chicago, Illinois, USA).

3. Results

Fig. 1 outlines the number of subsequent injuries occurring in a single season of adolescent rugby. 63% of players (521/825) were uninjured, with the remaining 37% (304/825) suffering at least one injury during the season, with 11.5% suffering multiple injuries (2 or more). A total of 426 injuries were eligible for analysis, of which, 121 were subsequent injuries (28.4%). 76% of subsequent injuries were considered new as they involved a different body region to the index injury (92/121); 19% (23/121) were recurrent, involving the same body region and diagnosis as the index injury; and 5% (6/121) were local, involving the same body region as the index injury, but with a different diagnosis.

3.1. Time to recurrent injury

Fig. 2 shows the time from return to play until recurrent injury. 78% (18/23) were early recurrences, occurring within 2 months after return to full participation. The median time-interval for a recurrent injury to appear was 18 days after full return to play (mean 35.6, SD 40.5, range 1–140 days).

3.2. Recurrence patterns

Table 1 subgroups recurrent injuries (n = 23) according to body part and diagnosis. The foot/ankle (22%), head (17%) and shoulder

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