

PREVENTING TACKLE INJURY EVENTS IN RUGBY UNION

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This paper reports a programme of studies; describing the nature and circumstances of tackle injuries in rugby union, the type of tackle and player actions which were risk factors for the tackle injury, and proposed modification of player actions leading up to the tackle to reduce the risk of tackle injury. The stopping tackle was the most prevalent and the most common tackle associated with injury was the high stopping tackle from the front or side. Tackle types and player actions that pose particular risks of injury are identified as well as possible areas in which coaching, refereeing or law changes may help to reduce the risk of rugby tackle injury.

KEY WORDS: rugby union, tackle, qualitative analysis.

INTRODUCTION: In studies investigating the nature of rugby union injuries, a consistent finding has been the high proportion of injuries that occur in the tackle situation (Garraway & Macleod, 1995; Hughes & Fricker, 1994; Lee & Garraway, 1996; Sparks, 1985). The New Zealand Rugby Injury and Performance Project (RIPP) found that 40% of all rugby union injuries occurred in tackles (Bird, Waller, Marshall, Alsop, Chalmers, & Gerrard, 1998). Rugby injuries cost the Accident Rehabilitation and Compensation Insurance Corporation of New Zealand (ACC) in excess of 21.5 million dollars in entitlement claims in 1998/99 (ACC, 2000). Hence the tackle has been identified as an aspect of rugby union carrying a substantial risk of injury and a high cost. Recent studies of tackle injuries have provided only limited descriptions of the circumstances of injury occurring in tackles and these descriptions have been only from the perspective of the injured player (Garraway, Lee, Macleod, Telfer, Deary, & Murray, 1999; Wilson, Quarrie, Milburn, & Chalmers, 1999). As a consequence, there is lack of information concerning the movements of the players in non-injury tackles. Additionally, we have not been able to find published data on the type and frequency of tackles occurring in rugby games. Hence, while more injuries have been associated with particular types of tackles, it has not been possible to determine which tackles pose the greatest risk of injury. Thus the first our studies was to develop a methodology to describe the player actions in rugby union tackles involving injury. This methodology was then used to describe the player actions in a large number of rugby union tackles to determine if there was any difference in player actions for tackles in which an injury occurred, compared with tackles in which no injury occurred. Finally, player actions were further examined to determine if game situations could be identified which would place players at reduced risk of injury in a tackle.

METHOD: *Study1:* The circumstances of injury occurring in tackles were identified for the injury data collected in the RIPP on 356 players and 569 rugby injury events occurring in games and practices during the 1993 Dunedin (New Zealand) club rugby season (Waller, Feehan, Marshall, Chalmers, 1994). Players provided a brief description of the circumstances associated with the injury occurrence (e.g., "-running, then tackled and fell awkwardly"). The content of the descriptions of the tackle injury events was reviewed. Terms used in the descriptions were listed and grouped in five major categories, with additional subcategories, according to the information provided. The categories with some examples of subcategories are as follows:

- (a) The role of the player. eg., Tackler or ball carrier.
- (b) Players action at the time of injury. eg., Stationary or running.
- (c) Nature of the tackle. eg., Smother or stopping.
- (d) Key factors in the tackle situation. eg., Falling in tackle or picking up the ball when tackled
- (e) Injury mechanics. eg., Impact with ground or torsion motion.

The categories were intended to encompass all the likely event descriptions for the RIPP tackle injury events.

This descriptive methodology was then trialed on videotape footage comprising 30 separate tackle incidents in which injuries occurred. Videotape was supplied by the New Zealand Rugby Football Union (NZRFU) Technical Advisory Committee of incidents drawn from New Zealand provincial and international rugby matches from the 1994 season. For the video analysis an injury event was identified when a stoppage in the game occurred. Initially, each of the incidents was viewed in slow motion by two observers, senior players working together, who had a thorough understanding of tackle actions in senior rugby. The incidents were viewed several times, until the observers agreed as to the circumstances of the injury event. A descriptive summary of the injury event was then compiled. Following this, the injury event was coded both for the injured player and the player causing the injury, according to a schema based on the categories developed from the event descriptions for the RIPP data. Summary statistics were calculated for the RIPP data regarding nature and circumstances of injury. These included: The role of the player, player's actions at the time of injury, the nature of the tackle, key factors in the tackle situation, and injury mechanics. Chi-Square tests were used to determine if significant differences existed between ball carriers and tacklers for site and type of injury. Summary statistics only are presented for the NZRFU videotaped events, to provide additional information on the role and action of players in the tackles. *Study 2:* Videotape footage of the 41 games of the 1999 Rugby World Cup (RWC) was obtained from The University of Wales, Centre for Performance Analysis, Cardiff, Wales. Access to the videotapes provided the opportunity to count the type and frequency of tackles, and to describe and analyse the actions of the injured and non-injured players in tackles in a case-control approach to determine risk factors for injury. Tackle injury events were analysed and coded according to the schema developed in Study 1, with relative speed of the players and tackle direction being added to the event description. The summary statistics approach, that was used for the analysis of RIPP data, was also used on the RWC data regarding the nature and circumstances of tackle events. Conditional logistic regression analysis was used to determine the significance of the variables describing the nature and circumstances of tackle events as risk factors for injury in tackles for ball carriers, tacklers and support players. *Study 3:* Videotape footage of six games from the 2001 Tri-Nations Super 12, rugby season were analysed to determine the type of pass that resulted in clear passage of the ball from the scrum half along the inside backs and reduced the likelihood of a tackle and hence tackle injury. In addition the study identified whether the passing technique was influenced by the mode of delivery from the ruck, and by the nature of the opposition defence. Summary statistics were calculated describing the tackled player and support player body actions as they entered the ruck, placement of the ball during the ruck, and the subsequent passes of the halfback and first-five eight.

RESULTS AND DISCUSSION: *Study 1:* Of the 569 RIPP injury events, 191 (33%) involved tackles, with 94% (of 191) occurring in games and 6% in practices. Seventy percent of injuries for the NZRFU video incidents occurred when the player was running or diving/falling to the ground. This is perhaps not surprising since rugby is a body contact game involving fast movement. However, approximately 30% of injuries occurred when players were being held in the tackle or with players falling over or stepping on the grounded player. Impact with other player(s) in the tackle situation was the most frequently observed injury mechanism (61%). Injury incidents were most likely to involve a stopping tackle (57%), which was defined as the ball still being available to be played in the tackle. Front-on tackles occurred nearly three times more often in the injury events than either side-on tackles or tackles made from behind. No particular action in the tackle (e.g., crouch, arms out, leg drive, wrap arms, etc.) appeared to be associated with a greater number of observed injuries. For both the RIPP data and the NZRFU video of tackle incidents, the tackler and ball carrier were found to be injured in almost equal proportions (A full description of this analysis is presented in Wilson et al 1999). *Study 2:* From the 41 games of the RWC, a total of 755 tackle events were coded for analysis - 151 tackle injury events (153 player injuries) and 604 tackles not involving injury stoppage. The most frequent type of tackle was the stopping tackle (67% of tackles). Tackle injury events were most likely to involve a stopping tackle (57%), which were most often mid-height tackles (62%), to the front (44%) or the side (44%). Tackles which were high (above mid-chest height) were significantly ($p < 0.05$) more likely to result in injury (odds ratio (OR)=2.03, 95% confidence interval (CI)=1.38-2.98) compared to the most

common mid-height tackles. The tackle involving a shoulder charge (3% of tackles) had a significantly ($p < 0.05$) greater risk of injury than the most common stopping tackle ($OR = 3.48$, $CI = 1.81-6.68$). A number of injury events involved illegal actions or were indicative of poor technique, for example, shoulder charge (8% of injury) or head high tackles (7% of injury) that reflect a need for correct coaching and/or firm refereeing decisions. Both the ball carrier and the support player in a tackle situation were significantly ($p < 0.05$) more likely to be injured in a tackle than was the tackler ($OR = 1.68$, $CI = 1.18-2.38$ and $OR = 2.00$, $CI = 1.06-3.70$ for ball carrier and support player, respectively). These players should be the priority for any coaching intervention to instruct players how to use body positions and actions that reduce the likelihood of injury. The most common player motion in the tackle was running/walking (66% of actions) in which 65% of injuries occurred. Tackles in which there was a high relative speed between players were significantly ($p < 0.05$) more likely to result in injury ($OR = 2.59$, $CI = 1.65-4.07$) than the most common mid-speed tackles. Low-speed tackles reduced the risk of injury compared to mid-speed tackles ($OR = 0.48$, $CI = 0.24-0.97$). Thus, low relative speed in the tackle, which is achieved by moving with the direction of the tackle, had a protective effect on injury in a tackle. Approximately 18% of injuries occurred while the player was stationary (upright or crouched). These injuries tended to result from impacts when players were being held in the tackle. Injury rates were considerably higher for tackles involving jumping or a player on the ground than for tackles involving running/walking. However, due to the small number of injuries associated with these actions only the motion of jumping in the tackle significantly ($p < 0.05$) increased the risk of injury in the tackle ($OR = 4.73$, $CI = 1.65-13.59$). *Study 3:* The results showed that in a typical stopping tackle the ball carrier was likely to stand in the tackle (35%) and turn towards the support in the majority of tackles (67%). The most common type of ball placement during the ruck was the reach and place close (40%), followed by the reach and place out (23%) and all fours between legs (11%). Spiral passes (46%) were used for the majority of the time by the halfback whereas the flyhalf used both spiral and lateral passes. When receiving the ball, the flyhalf was in a straight or open stance for the majority of the time. Fast ball from a ruck resulted when players first stand in the tackle then turn towards their support as they fall to the ground. The ball should be placed using either a side and roll, or reach and place out placement technique when going to ground.

CONCLUSIONS: Tackle injury events were most likely to involve a stopping tackle where the player is held with the ball available to be played in the tackle. Tackles which were high (above mid chest height) or involved a shoulder charge were significantly more likely to result in injury than the most common mid-height tackles. These tackles which are indicative of poor technique or illegal actions highlight the need for correct coaching and/or firm refereeing decisions. From the RWC analysis the ball carrier and support player were significantly more likely to be injured in tackles than the tackler. This finding has identified a target group that will benefit most from coaching intervention. Both the injured player and the player contributing to the tackle injury were most often in motion (running/walking) in the tackle with relative speed having a direct and significant relationship with tackle injury. This result has implications for coaching players how to protect against injury in the tackle situation with a strategies of "going with the tackler" or "turning in the tackle", moving to reduce the relative speed between players and conserving the ball carrier's momentum, having potential to reduce injury. Tackle injury was most often caused by impact with another player rather than impact with the ground. Since previous studies have shown that injuries to the head and shoulder are the most common type of injury, wearing padding in the form of headgear and shoulder padding may reduce the risk of injury from impact with another player. Opportunities for reducing injuries such as sprains and strains to the other more commonly injured sites, such as the knee, are less apparent. However, a greater emphasis on coaching players on how to pass quickly without putting their body at risk of tackle injury and in correct tackling technique may bring reduced injury risk benefits to both the ball carrier and the tackler and ball carrier. This was investigated in a preliminary way in Study 3 from which it was concluded that to produce fast ball from a ruck and hence minimise tackle opportunities, players must first stand in the tackle then turn towards their support as they fall to the ground. When going to ground, players should then place the ball using either a side and roll or reach and place out placement technique. In this paper, we have described the most

common tackles and the most common actions associated with tackle injury. We have also identified tackle types and player actions that pose particular risks of injury and suggested possible areas in which coaching, refereeing or law changes may help to reduce rugby tackle injury.

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