

# AN APPARENT REDUCTION IN THE INCIDENCE AND SEVERITY OF SPINAL CORD INJURIES IN SCHOOLBOY RUGBY PLAYERS IN THE WESTERN CAPE SINCE 1990

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*Objective.* To determine the impact of the 1990 rugby law changes in South African schoolboy rugby on the number of schoolboys suffering paralyzing spinal cord injuries in the subsequent eight rugby seasons (1990 - 1997) in the former Cape Province (now the Western Cape, but including Port Elizabeth and East London).

*Methods.* The study was a retrospective analysis of all patients with rugby-related spinal cord injuries admitted to the Conradie and Libertas Spinal Units, Cape Town, between 1990 and 1997. Data were initially collected annually from patient files. From 1993 patients were interviewed in hospital and a standardised questionnaire was completed. Data were collated and analysed.

*Results.* There were 67 spinal cord injuries in adult and schoolboy rugby players in the eight seasons studied. Fifty-four (80%) injuries were in adults and 13 (20%) in schoolboys, representing a 23% increase and a 46% reduction in the number of injured adults and schoolboys, respectively. Fifty-two per cent of those injuries for which the mechanism was recorded occurred in the tackle phase of the game; of these approximately equal numbers were due to vertex impact of the tackler's head with another object, or to illegal (high) tackles. Twenty-five per cent of injuries occurred in the ruck and maul and the remainder (23%) in the collapsed scrum. The only striking difference in the proportion of injuries occurring in the different phases of play was the absence of high-tackle injuries among schoolboys. The majority of injuries occurred at vertebral levels C4/5 (32%) and C5/6 (42%). Five players (8%) died, tetraplegia occurred in 48% and 35% recovered either fully or with minor residual

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disability. Playing position was recorded for half the injured players. Front-row forwards (props 33%, hookers 9%), locks (12%) wings and centres (21%) and loose forwards (15%), accounted for 90% of all injuries.

**Conclusions.** Introduction of rugby law changes in South African schoolboy rugby in 1990 may have led to a 46% reduction in the number of spinal cord injuries in this group. In contrast, the number of these injuries in adult rugby players increased during the same time period due either to an increase in the number of adult players or to a real increase in the incidence of these injuries. More injured schoolboy than adult rugby players made total or near-complete recoveries from initially paralyzing injuries (61% v. 28%). The reduced number of schoolboy injuries could not have resulted directly from the specific law changes introduced in 1990, which targeted scrum laws. Rather, the absence of illegal (high) tackle injuries among schoolboys appears to be the principal factor explaining fewer injuries in schoolboys, who suffered a higher proportion of injuries in the ruck and maul than did adult players.

Accordingly we conclude that a further reduction in spinal cord injuries in adult and schoolboy rugby players in the Western Cape requires: (i) the elimination of injuries occurring in the ruck and maul, and to the tackler; (ii) the strict application of the high-tackle rule in adult rugby; and (iii) a continuing, high level of vigilance. Concern must be expressed about the continuing number of paralyzing spinal cord injuries in adult rugby players.

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A previous report on spinal cord injuries in rugby players in the Cape Province identified the most common mechanisms causing these catastrophic injuries.<sup>1</sup> In particular, it was found that certain illegal procedures, including high tackling, probably accounted for 30% of all injuries. In addition, spinal cord injuries occurring in the scrum resulted from one of three mechanisms, namely at scrum engagement, with 'popping' of the scrum, or with scrum collapse.<sup>2</sup> These mechanisms, all potentially preventable, accounted for a further 21% of injuries. As such at least half of all injuries could have been prevented by the elimination of high tackling and by more rigorous control of the scrum.

Furthermore, the incidence of injury appeared to be on the increase in the Western Cape, in contrast to reports of falling incidences reported in other major rugby-playing countries such as New Zealand,<sup>3,4</sup> Australia<sup>5</sup> and the UK.<sup>6,7</sup> However this latter conclusion may not be correct; certain study limitations prevent the conclusion that the incidence of these spinal cord injuries has really fallen in other rugby-playing countries<sup>2,8</sup> except probably in New South Wales, Australia.<sup>9</sup> Indeed recent

reports document a rising incidence of spinal cord injuries among Fijian rugby players,<sup>10,11</sup> as may also be the case in New Zealand.<sup>2,12,13</sup>

As a result of the publication of that paper, changes to certain rugby laws specific to under-19 rugby were introduced in 1990. In particular, laws controlling the scrum formation (described subsequently) were altered,<sup>14</sup> and the 'flying wedge' and 'cavalry charge' were outlawed.

To assess any possible effect of these rule changes on the incidence of catastrophic spinal cord injuries in rugby players in the former Cape Province (now the Western Cape, but including Port Elizabeth and East London), the records of all admissions for rugby-related spinal cord injuries to the Spinal Cord Unit at Conradie Hospital between 1990 and 1997 were analysed retrospectively. In addition details, especially on the mechanisms of injury and the final outcomes, were also collected. During this time a second spinal cord unit was established in Cape Town at Libertas Medical Centre, Goodwood. Records of all rugby players admitted to that unit for the treatment of spinal cord injuries were similarly evaluated.

## MATERIAL AND METHODS

The records of all admissions for rugby-related spinal cord injuries to the Conradie Hospital Spinal Cord Unit and the Libertas Medical Centre for the years 1990 - 1997 inclusive were collated and analysed for the mechanism of injury, playing position, site of lesion and final outcome. These methods were essentially the same as those used previously,<sup>1</sup> with the exception that data were collected at the end of each year and the complete dataset analysed at the end of the 8th year.

During the 1990 rugby season, a 'standard set of variations to the laws of the game at under-19 level' were introduced into South African schoolboy rugby.<sup>14</sup> Significant alterations included the following set out below, not all of which were introduced immediately but all of which were operative in the 1998 season.

### Law 20: Scrummage

#### Forming a scrummage

In the interests of safety each prop should touch his opponent's upper arm, then pause before engagement according to the sequence crouch, touch, pause, engage.

1. In an eight-man scrummage the formation must be 3-4-1, with the single player at the back (normally the number 8) packing between the two locks who must pack with their heads on either side of the hooker.

2. Throughout the duration of a scrummage there must be 8 players from each side in the scrummage, except when these numbers are reduced by availability, a player or players ordered off under Law 26 (foul play), or injury.



seasons since rugby law changes were introduced specifically to reduce the risk of such injuries in schoolboy rugby players. Indeed, there has been an apparent 23% increase in spinal cord injuries to adult rugby players during this period.

In contrast, there is encouraging evidence that the number of injuries to schoolboy rugby players would seem to have decreased since the previous study (Fig. 1). Where there were 24 schoolboy injuries in the 8 years between 1982 and 1989, in the subsequent 8-year period covered by this study there were 13 such injuries, suggesting a 48% reduction in the number of schoolboy rugby injuries in the Western Cape.

It would seem, therefore, that as many as 11 new injuries may have been prevented by the introduction of rule changes to schoolboy rugby in 1990. These rule changes aimed to reduce the risk of injury in the scrum by reducing the forces at engagement, by 'depowering' the scrum, by preventing wheeling and moving the scrum more than 1.5 m, and by ensuring that only suitably trained players are allowed to scrum in the five tight-forward positions.

Furthermore it would seem that schoolboys suffered less severe injuries than adult players. Sixty-one per cent of schoolboys recovered completely or with only minor disabilities, whereas only 15 of the 53 adults (28%) recovered equally well. This might suggest that the trauma causing these injuries may be less severe in schoolboys than in adults, either because of differences in the nature of the game played by adults and schoolboys, or perhaps as a result of the rule changes introduced in 1990. Alternatively, schoolboys may be more likely to receive ideal early management of these injuries. It is generally believed that the quality of initial management of these injuries can influence the outcome.<sup>2</sup>

The distribution of the mechanism of injury was similar to that previously reported. Hence 53% of injuries occurred in the tackle phase of the game compared with 50% in the previous study; 25% v. 18% in the ruck and maul and 23% v. 21% in the scrum.

Surprisingly, the recorded proportion of injuries suffered by schoolboy (19%) and adult rugby players (24%) in the scrum was not significantly different, nor were these figures significantly different from the historical proportion (21%). This seems to suggest that the new rules, enacted specifically to reduce scrum injuries, may have been ineffective either because they were not enforced in games in which these injuries occurred or because they failed to address the mechanisms causing these injuries.

Alternatively, the previous report,<sup>1</sup> which did not differentiate the mechanism of injury between schoolboy and adult players, could have missed a higher proportion of scrum-related injuries in schoolboy than in senior rugby players. In that case, the present results would mean a real reduction in scrum-related neck injuries in schoolboys as a result of the law changes. We note, however, that the proportion of scrum-

related injuries remains the same in schoolboys and adults, still accounting for more than 20% of all injuries, which indicates that law changes alone have not solved this problem.

Rather, the fewer spinal cord injuries in schoolboys than adults would seem to be due to a lower proportion (0% v. 32%) of injuries caused by illegal (high) tackles, a consequence that could not have resulted directly from the 1990 rugby law changes.

It follows that if schoolboy injuries are to be further reduced, greater attention must be paid to the prevention of injuries during tackling and the ruck and maul, which together accounted for 81% of the recorded mechanisms of injury in schoolboys.

All injuries to the tackler in both schoolboy and adult rugby resulted from vertex impact and could theoretically have been prevented if the tackler had been taught to tackle using a safe technique.<sup>2</sup> We have previously reported that inadequate attention is paid to the development of tackling skills at schoolboy level,<sup>15</sup> but the problem clearly still persists at all levels of the game in the Western Cape.

While this study aimed to evaluate the effect of law changes on the number of catastrophic spinal cord injuries in schoolboys, it has also measured the effect of those rule changes on the number of injuries among senior rugby players. Here the results are less sanguine, as the number of these injuries seems to have increased in the past 8 years. This may conceivably have resulted from an increase in the number of senior rugby players in the Western Cape; however the mechanism of injury continues to indicate that the vast majority of these injuries are preventable.

High tackling accounted for 32% of spinal cord injuries in adults (Fig. 2), tackling and scrum collapse for a further 24% each, and the ruck and maul for 20%. Clearly, there is a continuing need to ensure that efforts to protect senior players from injury in these phases of the game should be intensified.

In summary, this study shows an apparent 48% reduction in spinal cord injuries in schoolboy rugby players following the introduction of law changes in 1990. Furthermore, injuries were less severe and 61% of injured schoolboys recovered fully or were left with only minor disabilities following initially paralyzing spinal cord injuries. However there was no evidence that the number of injuries in adult players had fallen during the same period. While this may have been due to an increase in the number of adults playing rugby in this region, the mechanism of injury continues to show that most of these injuries should be preventable.<sup>2</sup>

Surprisingly, the reduction in the number of schoolboy rugby injuries would seem not to have resulted directly from these specific law changes, as scrum-related injuries were apparently no less common than in the previous study. Rather, there may have been fewer injuries from illegal (high) tackles among

schoolboys, suggesting more strict application of the general rugby rules at schoolboy level since the previous publication.<sup>1</sup>

Efforts to reduce the risk of these catastrophic injuries even further will require: (i) a more concerted effort at the senior level of the game including the elimination of high tackling; (ii) efforts to understand and prevent injuries during tackling and the ruck and maul; and (iii) continued vigilance at schoolboy level of the game to ensure that progress made in the past 8 years can be further improved.

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