

# Concussion in Rugby: Insights, Incidence and Intervention



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Concussion is a traumatic brain injury resulting from a direct or indirect blow to the head causing alterations in brain function.<sup>1</sup> It is a complex pathophysiological process that may manifest in a number of ways reflecting physical, emotional, cognitive and sleep disturbances. There may or may not be loss of consciousness. Evaluation of the concussed player involves subjective symptom reporting, observation of physiological signs and more objective measures of neurological and cognitive function. As yet, no biological marker for concussion has been identified.<sup>2</sup>

Rugby Union is a collision sport with numerous phases of contact on the field resulting in the potential for collisions involving the head. The main area of play causing concussions is the tackle.<sup>3</sup> Distinguishing features of rugby that impact on injury management are that it is a continuous, multiple-sprint, un-helmeted collision sport in which players are only allowed to wear limited, padded protective gear.<sup>4</sup>

## Why is addressing concussion in rugby important?

Concussion has been the focus of 4 international consensus meetings since 2001, each resulting in a consensus statement and achieved an increasingly high profile in sports and exercise medicine literature over the last decade. The reasons for the increased focus on this topic and for appropriate medical protocols can be summarised as follows:

### 1. Severe Neurological Injury

Acutely, if not identified and managed appropriately, concussion may result in diffuse cerebral oedema (also referred to as Second Impact Syndrome) with resultant severe neurological compromise and even death.<sup>5</sup>

### 2. Distinguishing Concussion from

### Other Forms of Brain Injury

The symptoms and signs of concussion may mimic other more serious forms of head injury including intra-cranial bleeds.

### 3. Post Concussion Syndrome

Failure to recognise and appropriately manage concussion may result in symptoms persisting for weeks, months or years.<sup>6</sup>

### 4. Cognitive deficits

Concussion often affects young people in a learning environment; failure to recognise and manage the condition may significantly impair learning.

### 5. Impaired Performance and Increased Injury Risk

Previous concussions, especially those not managed appropriately, predispose to further concussions and also increased the risk of other injuries.<sup>7</sup>

### 6. Chronic Neurological and Psychological Sequelae

An increased incidence of depression has been identified in athletes who have suffered recurrent concussion.<sup>8</sup> Recurrent head trauma has also been associated with persistent cognitive deficits, especially in American Football players.<sup>9,10</sup>

Recent, high profile cases involving the death of young rugby players<sup>11</sup> and the high stakes of the NFL concussion law suit have elevated the public profile of concussion in sport.<sup>12</sup> As a result, the incidence of concussion in rugby is increasing whilst that of other traumatic injuries remains constant.<sup>7</sup>

## International Concussion Consensus

The management of concussion has evolved significantly over the last 14 years and has been largely guided by 4 International Consensus Meetings led by a multidisciplinary cohort of clinicians and researchers, the Concussion in Sport Group. The last meeting was held in Zurich in November 2012 and the next is to

be in Berlin in October 2016. World Rugby (formerly the International Rugby Board) is a sponsoring attendee of these meetings.

The most recent concussion assessment guidelines are the Sports Concussion Assessment Tool version 3 (SCAT3) and the Child SCAT for use in 5-12 year olds.<sup>1</sup> A variation of the SCAT templates, aimed at the office assessment of concussion is the Sports Concussion Office Assessment Tool (SCOAT).<sup>13</sup>

## Rugby's Concussion Mantra – "Recognise, Remove and Refer"

Regulation 10 of World Rugby's constitution defines concussion management and, acknowledging the higher incidence and potential for slower recovery in younger athletes, differentiates between management for adults (over 18) and children and adolescents (18 and under). Moreover, these guidelines define the use of the Head Injury Assessment Protocol (HIA) in professional Rugby (see page 7).

Appreciating the need for educating all stakeholders, World Rugby has developed a Concussion Guidance Document and on-line learning modules for the General Public, healthcare professionals, match-day medical staff and elite level match day medical personnel.<sup>14</sup>

There is evidence that younger athletes take longer to recover after a concussive injury than adults and that return to play on the day of the injury leads to subsequent cognitive deterioration.<sup>15</sup> Moreover, there are specific risks (e.g. diffuse cerebral swelling) related to head impact during childhood and adolescence. Consequently, a more conservative approach is recommended in all concussed footballers under the age of 18 years, regardless of the level of competition in which they participate.



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### Recognise & Remove



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### World Rugby Concussion Guidance for the General Public

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### World Rugby's On-line Portal

The World Rugby Recognise and Remove message incorporates 6 "Rs"

- **Recognise** - Learn the signs and symptoms of a concussion so you understand when an athlete might have a suspected concussion.
- **Remove** - If an athlete has a concussion or even a suspected concussion he or she must be removed from play immediately.
- **Refer** - Once removed from play, the player should be referred immediately to a qualified healthcare professional who is trained in evaluating and treating concussions.
- **Rest** - Players must rest from exercise until symptom-free and then start a Graduated Return to Play. World Rugby recommends a more conservative return to play for children and adolescents.
- **Recover** - Full recovery from the concussion is required before return to play is authorised. This includes being symptom-free. Rest and specific treatment options are critical for the health of the injured participant.
- **Return** - In order for safe return to play in Rugby, the athlete must be symptom-free and cleared in writing by a qualified healthcare professional who is trained in evaluating and treating concussions. The athlete completes the GRTP (Graduated Return to Play) protocol.

### GRTP protocol - each stage is a minimum of 24 hours

Stage	Rehabilitation Stage	Exercise Allowed	Objective
1	Minimum rest period	Complete body and brain rest without symptoms	Recovery
2	Light aerobic exercise	Light jogging for 10-15 minutes, swimming or stationary cycling at low to moderate intensity. No resistance training. Symptom free during full 24-hour period.	Increase heart rate
3	Sport-specific exercise	Running drills. No head impact activities.	Add movement
4	Non-contact training drills	Progression to more complex training drills, e.g. passing drills. May start progressive resistance training.	Exercise, coordination, and cognitive load
5	Full Contact Practice	Normal training activities	Restore confidence and assess functional skills by coaching staff
6	Return to Play	Player rehabilitated	Recover

National Rugby Federations are expected to adopt the World Rugby concussion guidelines and may adapt them but only to reflect a more conservative approach. In South Africa, the South African Rugby Union's (SARU) BokSmart injury intervention programme has evidence-based guidelines that have recently been expanded to include a number of practical tools including Concussion Advice Sheets, Return to Play Guidelines and Return to Learning Guidelines.<sup>16</sup>

### Professional Rugby

In community and age group rugby, players even suspected of having a concussion must be permanently removed from the game or practice. In professional rugby, a 10 minute temporary substitution law has been introduced during which a Head Injury Assessment (HIA) is undertaken under the supervision of the team or match day doctor. The HIA consists of the following components:

- **Criteria for permanent removal from the field** – tonic posturing, convulsions, confirmed or suspected loss of consciousness, balance disturbance, disorientation, confusion, behavioural changes or oculomotor signs (e.g. nystagmus)
- **Pitch Side Medical Assessment** – including immediate and delayed recall, verbal cognitive tests, tandem gait and a symptom checklist.

Recent additions to the process include the provision of a field-side monitor for video replays of injury incidents by team and match day doctors and the stipulation that the match day doctor may overrule the team doctor in deciding that a player should be removed.

The field side process is followed by a post-match HIA 2 evaluation and an HIA 3 after 48 hours, whether or not the player was permanently removed from the field.

### Advanced Care Settings

Although many cases of concussion resolve spontaneously over days to

weeks, some may require more frequent and advanced assessment by a multi-disciplinary team experienced in concussion management. Many professional rugby players will have access to advanced care settings which include:

- medical doctors with training and experience in recognising and managing concussion
- access to brain imaging facilities and neuroradiologists
- access to a multidisciplinary team of specialists including neurologists, neurosurgeons, neuropsychologists, neurocognitive testing, balance and vestibular rehabilitation therapists

Ideally all concussed athletes should be able to access such a network but it is particularly recommended when a player's condition deteriorates, concussions occur repeatedly or more easily in the same player, symptoms fail to resolve or the diagnosis is uncertain.

Medical personnel dealing with rugby players at any level should ensure that advanced concussion care is accessible within their referral network.

### Use of neurocognitive tests to estimate recovery of cognitive function

Cognitive deficits associated with concussion are typically subtle and may exist in a number of domains. Common deficits that follow concussion in sport include reduced memory (retrograde and/or anterograde), attention and ability to process information and slowed reaction times.<sup>6</sup> The use of neurocognitive tests in the management of concussion overcomes the reliance on subjective symptoms, which are known to be poorly recognised and variably reported, and allows detection of cognitive deficits, which have been observed to outlast symptoms in many cases of concussion. Ideally these tests should be compared with a subject's pre-existing baseline. The most widely used such test in rugby is CogState Sport whilst other platforms include ImPACT

and Headminders. It is important to remember that these tests form only one aspect of the clinician's evaluation.

Formal neuropsychological testing remains the clinical standard for the assessment of cognitive function and is recommended in any case where there is uncertainty about recovery or in difficult cases (e.g. prolonged recovery).

### Concussion Prevention

There is no good evidence that either headgear or mouthguards prevent concussion.<sup>18,19</sup> Mouthguards have a definite role to play in reducing the incidence of orofacial injuries and are strongly recommended. In fact the issue of "risk compensation" – inappropriate and more aggressive behaviour change on the rugby field as a result of a false sense of security when wearing rugby headgear – may cause a paradoxical increase in injury rates.<sup>1</sup> Risk reduction is best achieved through conditioning, good tackle techniques, consistent implementation of the laws of rugby and abiding by the "recognise and remove" philosophy.

### Conclusion

Concussion remains an area of concern in contact and collision sports due its potential for serious immediate and long-term sequelae. Rugby Union has not only adopted international consensus guidelines but customised them and implemented widely across all levels of the game in the interests of player welfare, assuming a leading role in the promotion of concussion management. Consequently, Rugby World Cup 2015 will see the application of an expanded system of field-side and follow-up protocols utilising technology and a network of clinicians to manage every suspected case of concussion appropriately.

All protocols referred to in this article are available at: [www.sportsconcussion.co.za/management-protocols/use-these-tools/](http://www.sportsconcussion.co.za/management-protocols/use-these-tools/)

**References available on request.**