

Q&A: Concussion—what it is and how sports science is making rugby safer

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Two decades ago there were only two criteria used to diagnose concussion. Jon Patricios, a sport and exercise medicine physician and co-lead author of the latest international consensus statement on

concussion in sport, discusses the science of head injuries and some of the protocols adopted by World Rugby to make the game safer.

What is concussion?

Concussion is a [traumatic brain injury](#) that occurs as a result of a force that's transmitted to the [brain](#). It manifests as a [functional change](#) in the way the brain operates. Most are transient and resolve completely if recognized and managed appropriately.

Usually, we don't see structural changes in the brain in the case of a [concussion](#). In other words the brain scans look normal. And so what we have available to us, what I call the visible wound, is the changes in [brain function](#).

That's what we as [medical professionals](#) treating concussion look for, what we assess and what we manage.

What are the obvious signs of concussion?

Things like [loss of consciousness](#), or a seizure, clear disorientation, or inability to walk or poor coordination.

When I started working with professional rugby players in 1995 as a rugby team doctor there were only two criteria which classified you as concussed. One was a loss of consciousness, and the other was amnesia ([memory loss](#)). We now have over 20 criteria that we look for including irritability, nausea, inability to concentrate, poor balance, emotional changes and heart rate.

The one thing [medical science](#) still doesn't have for concussion is what we call biomarkers—like a [blood test](#), or a saliva test, or an appropriate

brain scan. Once developed, these would be able to tell you if there's a concussion, how bad it is and whether it's resolving. Research in these fields is increasing exponentially and I think we will see these commercially available in the next five years.

What are the less obvious signs?

Much of the time the signs are subtle. Things like changes in movement. There may be symptoms which you rely on the patient reporting. We break those symptoms and signs down into what we call domains, which means we look at various aspects of brain and body function.

Those include [physical symptoms](#), like headaches and nausea. They also may include changes in balance, emotional changes, anxiety, concentration—those sorts of things.

They often include [cognitive changes](#) like an inability to concentrate. Also what we call autonomic functions like heart rate, which might not be regulated properly, and blood pressure changes.

If one doesn't take the athlete through a systematic approach one might miss some of the changes.

The other important thing is to "know the athlete"—understand what they are like before and injury. Evaluating the player before the season starts so you have a better understanding of how that player normally operates.

A player is knocked out cold on the field. What are the next steps?

The first thing is to treat it as you would any serious injury. And that's to

make sure the player is still [functioning physiologically](#): the airways are open, they are breathing and their circulation is adequate. That's the "ABC" of emergency medicine.

The second thing is to see if there are any serious injuries. For example, if the player has a neck injury. So you protect the airway and you protect the neck.

The next important aspect is to remove the player from further danger. You get them off the field where you can better assess them and monitor recovery, in an ordered, controlled, quieter medical space.

From there, you will work through your systematic evaluation, and assess which areas are most likely to have been affected.

You will repeat that evaluation within an hour or two and then within another day to see how they are improving (or not).

Often long rest periods are prescribed. Why?

As with every injury, there's a spectrum of concussions and probably every one is slightly different.

You might have had a more severe injury, a high impact, with a player who is highly symptomatic, and has a number of domains that manifest. Not just their physical symptoms, but their concentration, their emotions and their balance.

Long periods of rest might not necessarily be appropriate. So what we'll talk about is longer periods of relative rest, where you don't cocoon them but allow them to continue with activities of daily living and then purposefully incorporate exercise within 72 hours. We actually expose them to exercise gradually but early, but at a lower intensity. It has been

shown to actually speed recovery if you introduce gradual exercise in an appropriate way, early in the recovery stage.

Do the rules make the game safer now? Is it safe enough?

The rules [have changed](#) to improve identification of concussions and player safety.

In most collision sports, a player is obliged to go through a specific process before being allowed to return to the field. And these processes in the professional game have to be documented, and submitted before that player is allowed back.

The laws have been driven by the science behind concussion, which is encouraging.

Is it safe enough? Well, in collision sports you can never take concussions out of the game. Because as long as there's a potential to be involved in a tackle or to be hit by a fist there's the risk of [injury](#). But safety awareness is higher than it's ever been, and our protocols are evidence-based and more robust.

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