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Hard knocks: Concussion injuries in tennis

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ABSTRACT

Concussions in tennis are rare, but they do occur. As recent case reports have highlighted, players who sustain concussions in tennis can be affected for much longer than expected. This article, written for the coach, outlines the signs of concussion, concussion awareness in tennis, and the coach's role in mitigating risk and managing concussions in their players.

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INTRODUCTION

Concussion in sport is a rapidly growing issue world-wide, not only in contact sports where concussion is now a major issue, but also in non-contact sports such as tennis. In contact sports, investigation of concussion has focussed on the long-term consequences of repeated head injuries during a professional athlete's career (Pearce et al., 2014). Concern has also been raised about players continuing or returning to play following impact to the head where the likelihood of further injury is significantly increased (Nordström et al., 2014).

Concussion and tennis are not normally words that would be used within the same sentence. Concussion rates in tennis are statistically negligible (Pluim et al., 2006). Recently however, several highly ranked players have been public with their struggles recovering from this injury, that we thought it was prudent to discuss concussion in tennis, particularly with regards to understanding what a concussion is, how to recognise the signs of concussion on the tennis court, when is a player ready to return to training and playing, and finally understand the issue of post-concussion syndrome.

Causes of concussion	Onset of symptoms	Noticeable symptoms
Direct impact to head (i.e. from tennis ball)	Immediate	Loss of consciousness only in 5-20% of cases (Finch et al., 2013; Meehan et al., 2010).
Head hitting hard surface (i.e. tripping during warm up or play)	Delayed – by minutes or sometimes by hours or days.	Headache; nausea, blurred vision, fatigue.
Indirect force to upper body causing whiplash action		Cognitive signs: loss in memory; confusion; ability to think; inability to focus. Motor signs: slowness in reaction; slurred speech; impaired balance.
		Descriptions: "...not quite right", " ...having my bell rung", or "I couldn't see anything for a couple of seconds" (Ropper, 2008)

Table 1. Causes and noticeable signs of concussion (McCrory et al, 2013).

Recognising the signs of concussion

Sports-related concussion constitutes approximately 20% of mild traumatic brain injury cases, which itself makes up nearly 80-90% of all traumatic brain injuries (Langlois et al., 2006). The consensus statement following the 4th International Conference on Concussion in Sport defined concussion as a brain injury involving pathophysiological processes induced by biomechanical forces (McCrory, Meeuwisse, Aubry, Cantu, Dvoák, et al., 2013). Table 1 illustrates key causes and warning signs of concussion.

CONCUSSION IN TENNIS

Although rare, concussions in tennis players have occurred. Reports of players sustaining concussions indicate these are the result of falls, which is the most common reason for concussion injuries (Ropper, 2008). For example, Victoria Azarenka suffered concussion at the 2010 US Open when warming up and catching her foot at the bottom of her sweatpants. Azarenka went onto play her match but collapsed on court 30 minutes into the match. In the same year, British player Sarah Borwell was playing a doubles match when one of her opponents hit a smash impacting directly into Borwell's head (Myles, 2015). Feeling fine, Borwell continued to play, winning the match. However following the game symptoms appeared:

As soon as the adrenaline wore off I was a mess. I was feeling sick. I was dizzy, and my face swelled up on the left hand side...They monitored me for the evening, kept checking every hour and the next day, I had an MRI in San Francisco and they saw a bruise on my brain (Myles, 2015).

Despite the MRI findings, Borwell was told that she would be fine within seven days. Still feeling the effects of concussion (fatigued, photophobic and unsteady) Borwell continued to the next tournament and given a clearance that she could play. However, Borwell could not actually undertake any physical activity, finding difficulty in simple motor tasks such as walking straight and keeping her balance (Myles, 2015). It took nearly one year for Borwell's symptoms to dissipate. More recently Eugene Bouchard and Casey Dellacqua showed ongoing symptoms following their concussions after falls. Bouchard, falling in a change room accident, took over three months to

recover from concussion (Henley, 2015). In October 2015 Dellacqua, falling on the court during a match in Bejing, missed the 2016 Australian summer season (Henley, 2015).

Importance of concussion awareness in tennis

In the USA, it is estimated that there are, per year, 1.6-3.8 million hospitalisations for sports- and recreation-related head injuries (Langlois et al., 2006). However, it is well known that sports concussion is often unrecognized, downplayed or dismissed and therefore goes unreported to doctors or a hospital, with the true incidence of concussion being estimated at a factor of 6 to 10 times more than what is officially recorded (Langlois et al., 2006). Although concussions in tennis are unlikely, it is possible that some players could be hit in the head with a ball or fall during play. Therefore it is important for coaches to be aware of how concussion can occur, ways to assess a concussion, how to manage a concussion, and to also to be aware of the signs of post-concussion syndrome or PCS (as highlighted in the examples of PCS with Borwell, Dellacqua, and Bouchard).

In contact sports, concussions can occur following a direct hit to the head, but this is not always the case with many concussions occurring from a violent bump or check to the upper body that can cause a whiplash action of the head (front to back, or side to side). However for tennis, concussions are likely to occur following a direct hit to the head (from either a tennis ball or head hitting the ground after falling). If a player is suspected of a concussion, they should be assessed using the Sports Concussion Assessment Tool-Version 3 (SCAT-3) by the tournament doctor (McCrory, Meeuwisse, Aubry, Cantu, Dvoøák, et al., 2013). The SCAT-3 comprises of eight sections covering symptom evaluation, cognitive and working memory evaluation, neck, balance and upper limb examination (for further information regarding the SCAT-3 the reader is referred to McCrory et al (2013).

Current guidelines regarding the management of concussion, at present, suggest physical and cognitive rest should be prescribed until the acute symptoms resolve (McCrory et al., 2013). However data is limited on the efficacy of complete rest after concussion, with some researchers questioning if rest is the best possible treatment (DiFazio et al., 2015). However there is consensus with regards to the suitability for individuals in returning to training and play, via a graded program of physical exertion, each stage completed without symptom present, required prior to medical clearance (McCrory et al., 2013).

For a small number of individuals, concussion symptoms may not resolve. The cases of Borwell, Dellacqua, and Bouchard demonstrate that post-concussion syndrome (PCS) is a serious issue that can affect a player's career. In particular, the cases of Borwell and Bouchard highlight the importance of return-to-play guidelines prior to returning to the court, with both players passing concussion assessments, yet were unable to play competitively. Table 2 lists the common symptoms of PCS that coaches can be aware of, the timeline that PCS can last for, and potential treatment options that can be prescribed by a medical practitioner or clinical psychologist.

Symptoms reported	Duration of symptoms (20% of those following concussion)	Treatment options
• Headaches • Dizziness • Fatigue (inability to exercise) • Irritability • Unable to concentrate • Visual disturbances • Memory impairment • Sensitivity to noise • Depression and anxiety	• Weeks to months • Sometimes up to year	• Medication • Psychological support • Cognitive-restructuring

Table 2. Characteristics of post-concussion syndrome

Education	Training	Competition
First aid accreditation updated	Clear courts of hazards (eg hose removed from back of court; balls cleared away and not left on court)	Responsibilities could include ensuring and overseeing: • Match conditions are safe for players • Venue and its facilities are safe for all on site This necessitates that Occupational and Health Safety policies for the match venue are up-to-date and implemented. Tournament personnel may need to be trained and briefed.
Concussion awareness education (part of professional development)	Ensuring change rooms and general facilities/areas are free of hazards (e.g., slippery and/or uneven surfaces)	Coaches should have open discussions with their players about the risk of concussion and how to best respond to any such incident, erring on the side of caution and reporting it immediately. Physical well-being should never be compromised ahead of 'winning'.
	Phone access for medical emergencies Knowing and implementing return-to-training protocols through graduated increase in physical activity	

Table 3. Implications for coaches in mitigating concussion injuries.

Tennis coach's role in concussion awareness

Coaches can play a significant role in mitigating risk of concussions in their players (Table 3). Firstly, coaches must be aware of their own knowledge limitations in this complex neurological condition; conversely, coaches must also be aware that their duty of care is enormous, given the potential of time lost for players to train and compete following a concussion injury.

It should also be noted that males and females can differ greatly in their symptomatic presentation, but as noted by Brown et al. (2015) differences can be explained by normal hormonal changes associated with the menstrual cycle. Conversely, it has been suggested that concussion symptoms can be downplayed by males (Sanderson et al., 2016). However, coaches should be aware of other coaches' attitudes towards concussion as many continue to underplay the potential seriousness of this injury (Caron et al., 2015).

CONCLUSION

Although concussion in tennis is rare, injuries have been documented in players with disturbing results. When medical professionals are not available, coaches should be concussion

aware, given the current culture of players to 'underplay' the potential seriousness of their injury. Sideline concussion assessments are available and can assist in the evaluation of a player's injury and determination to return to play. However, further case studies detailing concussions during tournament play will assist with awareness of the issue.

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