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Return-to-play after Concussion, a pragmatic approach

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INTRODUCTION

Concussion is defined as a “complex pathophysiological process affecting the brain induced by biomechanical forces.”⁽¹²⁾ Although all sports’ participants are to some degree exposed to concussions, collision or contact sports are more closely associated with this type of injury.^(6, 12) With an increasing number of participants in these types of sports globally, the chances of a clinician having to treat such an injury are high.⁽⁶⁾ Once an individual has sustained a concussion, their chances of sustaining another one are immediately increased, as previous concussion is a clearly established factor associated with concussion.⁽¹⁾ Besides a subsequent concussion, there are equivocal reports suggesting that premature return to play (RTP) following concussion may predispose one to both short and long term neurocognitive sequelae and can even be fatal.^(6, 8, 12)

Although the recent consensus statement on concussion in sport argues that the empirical link between concussion and long-term neurocognitive disorders such as CTE are tenuous,⁽¹²⁾ the clear risk of sustaining further brain injury or potential long term neurocognitive consequences should warrant careful and thoughtful clinical management.

There are numerous examples of RTP guidelines which,^(2, 3, 6, 8, 9, 12) if conflicting or different in their advice, could cause confusion among clinicians, players and coaches who are correctly trying to implement appropriate RTP protocols in their concussed players.

Therefore, the specific topic of this review is “Return-to-play after Concussion, a pragmatic approach”.

METHODS

The following databases were initially searched on the 18 September 2014 (and re-checked before final editing on the 5th December 2014): Medline (PubMed) and ClinicalKey. Owing to this rapidly evolving field, only articles for the last five years were considered for Pubmed using the following search strategies: “Brain concussion” (MeSH term for ‘concussion’) and “Post-concussion syndrome” (MeSH term for symptoms post-concussive event) and “Sports” (MeSH heading) and the following MeSH terms: “Diagnosis”, “Signs and Symptoms” or



“therapy” (MeSH subheading). Systematic reviews, Guidelines and Patient information were considered. In all of these, the latest version of the Consensus Statement for Concussion in Sport ⁽¹²⁾ and World Rugby guidelines for concussion for the general public ⁽²⁾ were used as a point of reference. For *ClinicalKey*, the most recent revision of FirstConsult (formerly MedConsult) and Patient Education articles on “concussion” were consulted. Any supplementary information that these articles referred to (such as SCAT3) were also included.

RESULTS

The described search strategy on PubMed yielded eight systematic reviews, one “FirstConsult” (physician information) article ⁽⁹⁾, and four patient guidelines. The four guidelines were from the following sources: World Rugby (WR) (formerly the International Rugby Board or IRB) ⁽²⁾, *ClinicalKey* ⁽¹⁰⁾, Center for Disease Control and Prevention (CDC) ⁽⁴⁾, and Journal of American Medical Association (JAMA) ⁽¹³⁾.

Return to play (RTP) following a concussion is discussed in four of the systematic reviews ^(3, 6, 8, 12) and three of the guidelines ^(2, 9, 10). The most recent systematic review on RTP following concussion by Cancelliere et al. ⁽³⁾ concluded “*there is no evidence on the effect of return-to-play guidelines on prognosis*” and urgently calls for more research in this area.

However, the paucity of RTP research evidence is likely a result of the complexity and difficulty in performing a study to investigate this particular question. Implicitly, different individual responses to a concussion, and recovery post-concussion, would make it difficult to ascertain if prognosis was related to compliance to a particular set of guidelines or simply to the nature of the index concussion injury. Thus, in the absence of such research, one must rely on consensus documents, position statements and expert guidelines (physician and patient) for such advice: these are summarised below.

Graduated Return To Play (G RTP) protocol

All the sources, except for the *ClinicalKey* patient guidelines,⁽¹⁰⁾ mention a six-stage G RTP protocol following concussion (figure 1). The *ClinicalKey* patient guidelines ⁽¹⁰⁾ refer the patient to their healthcare professional before returning to sport.

The G RTP is a stepwise progression that slowly increases the physical demands of an injured player, as long as they remain asymptomatic. If the player develops any concussion symptoms (either during or after the activity) they are required to regress to the previous step of the G RTP protocol and they need to remain asymptomatic at that step for the prescribed minimum number of days related to that stage before attempting to progress again.⁽¹²⁾

The use of symptoms as a guide for progression also assumes that there are no pharmacological agents (e.g. painkillers, anti-depressants) masking the symptoms.

Importantly, all sources state the importance of seeing a licensed healthcare provider, in the South African context this would be a Medical Doctor, before entering the GRTP and again before returning to full contact practice, *even if all symptoms have resolved.*

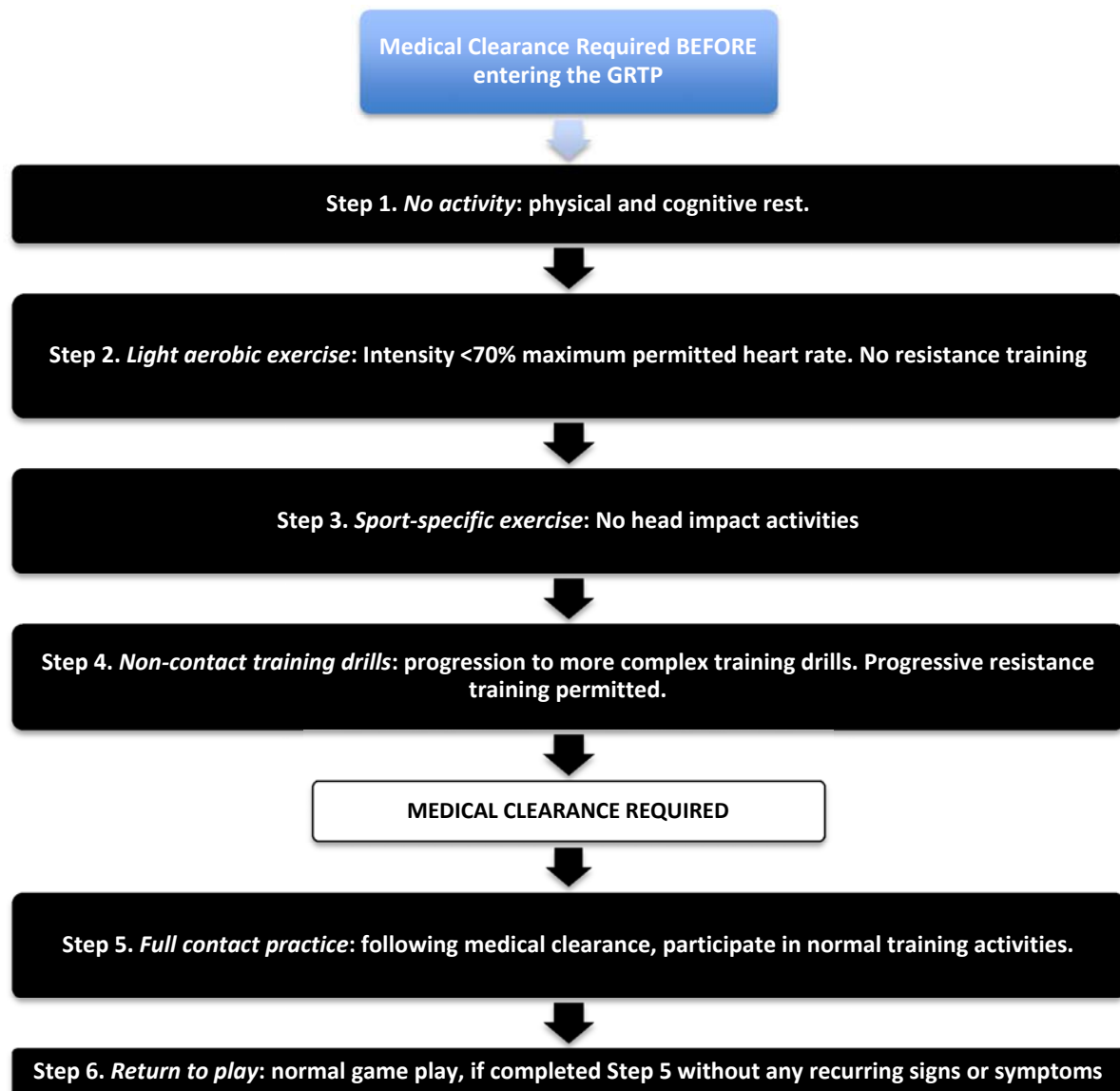


Figure 1. Graduated return-to-play (GRTP) protocol ⁽¹²⁾.

While the GRTP guidelines are generalizable to players of all ages, it is clear that children and adolescents should be treated as “special populations” (6, 12) with respect to the number of rest days following the injury, which culminates in a different minimum number of missed days for these populations. These protocol differences are summarised in Table 1. In South African rugby, children and adolescents are grouped as players 18 years of age or younger, and adults are grouped as players 19 years of age or older.

Any player with a second concussion within 12 months, a history of multiple concussions, players with unusual presentations or prolonged recovery should be assessed and managed by health care providers (multidisciplinary) with experience in sports-related concussions ideally within an Advanced Care setting.

It is recommended that if this expertise is unavailable then as a minimum these players should be managed using the protocol from the lower age group i.e. 1. ‘Players 19 years old or older’ then use the ‘Players 18 years old or younger’ protocol and 2. For ‘Players 18 years old or younger’, the minimum rest period should be doubled i.e. 4 weeks off instead of 2 weeks. (2)

Age group*	Minimum asymptomatic rest period from the time of injury (days)	Minimum asymptomatic time between GRTP steps (days) #	Minimum missed days
Children & Adolescents	14	1 (x 5)	19
Adults	7	1 (x 5)	12

**The specific ages are context specific. For South African Rugby, “Children and Adolescents” are all players younger than 19 years old. “Adults” are any players 19 years old or older. Caveat: with a history of multiple concussions, a player should adopt the GRTP protocol from the age group below them. (2)*

#If the player becomes symptomatic they regress to the previous step and must remain asymptomatic for the stipulated minimum period before attempting to progress again. They must also consult directly with their treating medical doctor before doing so.

RTP – Return to play

Although not mentioned by all sources, the *ClinicalKey* physician guidelines and consensus statement (12) also requires that the player has returned to a normal school or work schedule before returning to sport. This may be due to the effects of a concussion, which are systemic rather than a localised injury (6).

World Rugby’s guidelines (2) suggest that the following are also used to aid the Medical Doctor’s RTP decision: neuropsychological testing, general and neurological examination, verbal memory tests and balance assessment.

“Difficult” concussion cases

According to the consensus statement for concussion in sport ⁽¹²⁾, 80-90% of concussions will recover using this graduated RTP protocol. For the remaining 10-20% (“difficult patients”), further investigation and multidisciplinary evaluation incorporating multimodal interventions may be required. For example, there is some evidence that vestibular testing and training – which could be administered by a physiotherapist – might be beneficial in certain cases ⁽¹²⁾. Also, there is some evidence that it may be beneficial for these persistent cases to begin at Step 2 (light exercise) even with symptoms ⁽¹²⁾.

Danger of premature RTP

Only one source – the American Medical Society for Sports Medicine’s (AMSSM) position statement ⁽⁸⁾ – discussed issues related to non-compliance or not adhering to a safe GRTP, as described in this review.

The short-term risk to a player who has returned to play prematurely after a concussion is another concussion, or second impact syndrome, which is more severe and potentially catastrophic; worst case scenario, fatal. Although yet to be established with long-term epidemiological studies, another potential long-term consequence could involve some form of chronic cognitive dysfunction.

DISCUSSION

The main finding from this review is that there is consistent, high-level evidence consensus that the safest return to play (RTP) protocol for the majority of concussions involves a six-stage graduated process (Figure 1). This graduated process increases exercise intensity and sport-specificity one stage at a time and uses symptoms as the ultimate guide to progression or regression through the protocol. Only once the player has passed through five stages asymptotically can they return to normal play. Importantly, all sources mention the importance of involving Medical Doctors (within a multidisciplinary healthcare team if possible) in guiding the concussed player through this protocol.

In the high-level evidence that was summarised for the present review (as described in the Methods section), there were no ‘pragmatic’ suggestions made for RTP. However, a coach and medical doctors and other treating health care professionals should all consider making players recovering from a concussion more aware of the dangers of returning too early, should guide them more on the correct process to follow and insist that they are managed and cleared via the stepwise GRTP process before returning to rugby.

As concussions are typically non-visible injuries, the wearing of a visible garment could increase the awareness of the injury to other players while the injured player progresses through the GRTP. An example of a visible garment could be a coloured bib or vest.

As the concussed player attempts to return to school or work, the player and their Medical Doctor should inform the player's teacher or boss of their injury and also provide them with some practical advice regarding the player's associated reduction in capacity for high workloads and stress ⁽¹²⁾.

In conclusion, for a player to return to rugby safely following a concussion, and after having been medically cleared to do so, they need to be guided through the described six-stage GRTP protocol by a licensed healthcare provider (in this instance a Medical Doctor).

Medical Doctors need to then engage the player's parents or spouse, teachers or bosses and more importantly their coaches on how to best manage the player during the GRTP protocol after their initial post-concussion clinical assessment to ensure maximum chance of players adhering to these prescriptions. Importantly, the rest periods are age-group specific and also concussion history specific, which results in different amounts of minimum missed time from play for each player.

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