

Motorsport Safety and Rescue

Discussion Paper: Return to Competition after Concussion

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Introduction and Context

Concussion and Mild Traumatic Brain Injury (see definitions below) are common in the motorsport environment, especially during motorcycle competition.

The international medical community is increasingly concerned about premature return to competition for any athlete at risk of repeated head injury. There are no clear guidelines on this matter from Motorcycling Australia or CAMS, although the issue is well managed at higher levels of motorsport such as in Formula One.

These issues are especially pertinent during multi-day endurance events such as the Australasian Safari. A competitor may typically suffer an unwitnessed blow to the head during a fall in a remote location, and be found by a fellow competitor with signs and symptoms meeting the criteria for concussion in the minutes after the incident. The history of any loss of consciousness can be very difficult to reliably ascertain.

This subset of patients often may not meet clinical criteria for a CT Scan of the head and therefore may not be medically evacuated to a secondary or tertiary hospital. Frequently they are observed in a small local hospital for a brief period and/or informally monitored in the service park by the event medical staff.

There may subsequently be significant pressures on event medical staff to sanction early return to competition, especially where a competitor has been rested for 24-48 hours and exhibits no symptoms or signs of neurological impairment.

References and Acknowledgement

The information presented here is extracted from the UpToDate clinical information database topic "Concussion and Mild Traumatic Brain Injury" – an evidence based summary compiled from comprehensive and current literature review.

Suggested guidelines draw upon multiple sources however largely reflect American Academy of Neurology parameters.

Clinical Outline and Definitions

Concussion is considered here as a subset at the lesser end of the spectrum of *mild traumatic brain injury* (GCS 13-15 at about 30 minutes post injury).

The American Academy of Neurology defines concussion as a trauma-induced alteration in mental status that may or may not involve loss of consciousness. There have been a variety of summary and consensus documents over the past decade describing the functional syndrome of concussion as having features including direct or transmitted traumatic etiology, rapid onset, progressive and spontaneous resolution, and absence of gross structural changes on imaging studies. CNS disruption is considered to occur mostly at the histological and neurophysiological level.

Concussion has traditionally been graded on a three-point scale, although accepted definitions vary. The most important features of each concussion episode are (in increasing order of severity and clinical significance):

- transient signs of confusion and disorientation (see list below)
- presence or absence of amnesia
- presence or absence of loss of consciousness of any duration

Caution regarding return to competition is aimed at reducing the risks of:

- *further episodes of concussion*, to which any athlete in the early post-concussion phase may be more readily prone
- more serious *second impact* episodes, which, although rare and controversial, may have catastrophic neurological outcomes
- *cumulative neurological damage* over multiple episodes of concussion

For the purposes of this discussion regarding early return to motorsport competition, patients are assumed to have been cleared of any subsequent neurological emergencies or focal neurological deficits, and in most cases would not have met the clinical criteria for CT imaging.

Clinical Features of Concussion

Signs and symptoms may evolve over minutes to hours after injury.

Symptoms may include headache, dizziness, nausea, vomiting.

The following clinical signs may be present in the athlete with a concussion:

- vacant stare and delayed verbal expression
- distractibility and disorientation
- slurred or incoherent speech, gross incoordination
- emotional lability
- short term memory deficits
- loss of consciousness may or may not be present

Post concussion features (such as headache, dizziness and cognitive disturbances) may also evolve over days or weeks post-injury, and are beyond the scope of this discussion.

Suggested Clinical Approach to Head Injury for Australasian Safari

1. Initial Neurological Assessment

Neurological assessment at scene for focal deficits and features of concussion. This should include a mini-mental state examination and assessment for cerebellar signs and any period of amnesia.

Medical teams and/or the FIV Controller need to specifically question co-competitors (on scene by radio or as soon as possible afterwards) to determine whether definitive loss of consciousness

is/was present. Such bystander assessment may admittedly be problematic but should be actively sought nevertheless.

2. Disposal of Patient

Transfer to secondary or tertiary hospital for CT Imaging and/or observation if any focal deficits or CT criteria exist.

Patients with isolated mild traumatic brain injury (GCS 13-15), including concussion, should be removed from competition immediately and observed as appropriate in local medical facility, service park or under supervision of family/crew with head injury advice.

3. Return to Competition

In a small number of cases, return to competition within the event may be appropriate, see discussion below.

All other competitors (and the relevant sporting authority, usually Motorcycling Australia), should be advised on rest periods from competition as required.

Criteria for CT Brain Scan

The Canadian CT Head Rules apply to the assessment of adults with mild traumatic head injury.

High risk of need for surgical intervention is associated with:

- GCS less than 15 at 2 hours post trauma
- suspicion of open, depressed or base of skull fracture
- two or more episodes of vomiting
- age over 65 years

Medium risk is also associated with:

- amnesia for more than 30 minutes pre-event
- dangerous mechanism

The latter will give the most problematic scope for subjective discussion. Examples given for dangerous mechanism of trauma in adults include fall from more than 1 metre, pedestrian struck by motor vehicle, passenger ejected from MVA. Obviously many (but not necessarily all) motocross competitors will fall into this category. The CHALICE criteria (for CT imaging in children) define dangerous traffic accidents at > 60 km/h.

Any anticoagulation or antiplatelet therapy should also be considered to increase the need for CT imaging, as would any focal neurological deficit or seizures (especially multiple).

Considerations for CT imaging of the brain are separate from any simultaneous concerns about clearance of the cervical spine, which is not considered here.

Suggested Approach to Return to Competition for Australasian Safari

There are a number of published staged protocols, provocation tests and criteria for return to sporting competition, which are un-validated and also largely impractical for motorsport purposes. These protocols tend to be more conservative for adolescent athletes and are mostly based upon experience in contact field sports.

Nevertheless, common criteria include:

- immediate removal from competition upon suspicion or diagnosis of concussion
- no return to competition whilst any signs or symptoms of concussion are present
- loss of consciousness, prolonged amnesia or concussive symptoms, and multiple episodes of concussion mandate rest from competition

Therefore, return to competition in the Australasian Safari *might* be considered for the following small subset of competitors after concussion:

- all signs and symptoms of concussion completely resolved
- no loss of consciousness was recorded at the scene
- concussion symptoms lasted less than 30 minutes
- amnesia was brief or absent
- no other episodes of concussion during current event

Serial examinations should encompass full neurological (including cerebellar) assessment and at least mini-mental state and short term memory testing.

An aid to assessment may be a commercially available cognitive testing regimen (such as the ImPACT Test) which can be administered reliably on-event. It is impractical to collect baseline tests for all competitors at the grassroots level of motorsport, however post-injury tests can be used against validated population baseline results and may give objective evidence for or against return to competition.

Further Considerations

A break of at least 24-36 hours out of competition will be prudent in most cases even in milder cases of concussion. Extra caution should be applied to younger competitors in the 15-19 year age group in line with suggested guidelines for the developing adolescent brain.

The concept of a provocation test before return to competition is impractical in motorsport, but wherever possible *any returning competitor should be medically reassessed after the first stage of competition* on the day of return before being allowed to continue. For the Australasian Safari, this would typically be undertaken by an MIV crew in the mid-day service area.

Typically the competitor requesting return to competition will appear bright, well and clinically normal 24-48hrs post-concussion, and enthusiastic to resume. Exclusion from the event is NOT a wider safety issue ensuring that the competitor can undertake proper control of their vehicle, but rather a personal health precaution aimed at avoiding second impact concussion and cumulative neurological damage before the original insult has resolved. It will be important to communicate this to excluded competitors.

Guidelines on Rest From Competition

Mild Head Injury or Concussion with high risk features:

- Multiple episodes of low grade concussion – one week
- Prolonged concussive features or amnesia – one week
- Brief loss of consciousness (seconds) – one week

- Multiple episodes of higher grade concussion – two weeks
- Prolonged loss of consciousness (minutes) – 2 weeks

In all cases competitors should be advised to defer competition and seek medical evaluation on return home if concussive or post-concussion features recur.

For Mild, Moderate or Severe Head Injury where the patient has been evacuated to secondary or tertiary hospital, seek advice and follow-up from treating neurosurgical team.