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On-field management and return-to-play in sports-related concussion in children: Are children managed appropriately?

Harini P. Haran[a,b,c], Silvia Bressan[a,b,d], Ed Oakley[a,b,e], Gavin A. Davis[b,e], Vicki Anderson[b,e], Franz E. Babl[a,b,e,*]

[a] Emergency Department, Royal Children's Hospital Melbourne, Victoria, Australia
[b] Murdoch Childrens Research Institute, Melbourne, Victoria, Australia
[c] Monash University, Clayton, Victoria, Australia
[d] University of Padova, Italy
[e] Department of Paediatrics, University of Melbourne, Victoria, Australia

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ABSTRACT

Objectives: On-field management and return-to-play guidelines aim to ensure the identification and appropriate management of the concussed athlete. Compliance with current guidelines in many settings is unknown. We assessed whether key components of current concussion guidelines are being followed in child athletes.
Design: Prospective observational study.
Methods: Data were collected from children (5–18 years) presenting to a paediatric emergency department with sport-related concussion via researcher-administered surveys in the emergency department and during a follow up phone call. On hospital discharge all patients received a return to sports fact sheet based on the International Concussion in Sports Group.
Results: Ninety-three had sustained a concussion (mean age 12.7 (±0.27) years, 83% male). Sports played included Australian Football (47%), soccer (12%), rugby (9%) basketball (8%), other (25%). 82% participated in organised sports. Concussive signs or symptoms included loss of consciousness (41%), disorientation (36%), vomiting (23%), amnesia (30%), headache (60%). For concussive injury in organised sports ($n = 76$), overall 42% were not managed according to recommended guidelines: 19% were not immediately removed from play, 29% were allowed to return to play on the same day and 27% were not assessed by qualified personnel. 93% of parents and 96% of patients were unaware of concussion or return-to-play guidelines from their organisations. Overall, 72% were compliant with provided return-to-play guidelines.
Conclusions: Many children with sports related-concussion are not formally assessed on-field and continue to play. On-field concussion management and return to play practices are often suboptimal. Awareness and education of coaches, teachers, parents and children need to be improved.

1. Introduction

Sports-related concussion has received growing media and scientific attention in recent years for its increasing incidence and possible short and long-term sequelae.[1] Children are particularly vulnerable with 65% of all sport-related head injuries presenting to US emergency departments (EDs) being in persons aged 5–18 years.[2] In Australia, the impact of concussion on the child and on the health sector is not well described, despite 63% of school-aged children participating in at least one organised sport outside school hours.[3]

Concussed athletes, who return to play whilst still symptomatic, have an increased risk of recurrent injury and associated complications. This is due to a pathophysiological window of brain vulnerability post-concussion, as well as a post-concussion reduction in reaction time, information processing and speed, exposing the athlete to the demands of sport with a reduced capacity for evasive and defensive actions, with resultant increased risk of recurrent brain injury.[4,5]

The main issues of concern therefore are concussion management at the time of injury and timing of return to play. The International Concussion In Sport Group (CISG) consensus statement,[5] and position statements from the American Medical

* Corresponding author.
E-mail address: Franz.babl@rch.org.au (F.E. Babl).

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Society for Sports Medicine (AMSSM)[6] and the American Academy of Neurology (AAN)[7] all advocate prohibition of athletes returning to play/train on the same day as their injury.

In Australia, both the Australian Football League (AFL) and the National Rugby League (NRL) recommend immediate removal from play, first aid management and assessment by medical personnel for athletes with suspected concussion, as per the CISG 2012 Consensus Statement on Concussion in Sport.[5,8,9] In Australian Football, junior leagues are required to have a person with current first aid qualifications available at all games.[8] Once concussion has been diagnosed, both sporting bodies mandate a graduated return-to-play process commencing once the athlete is asymptomatic, progressing to normal game play in a minimum of 6 days. No evidence based guidelines for safe return-to-play following sport-related head injury have been validated for children, and the current guidelines are modelled on those for adults recommended in the CISG 2012 Consensus Statement.[5,10]

It remains unclear if general or sports specific guidelines for concussion management translate into changed on field practice, and how much players and parents know about the management of concussion and return to play instructions. There have been few studies assessing on-field management of head injuries in children and youth, or coach awareness and understanding of recommended guidelines. A recent survey of community AFL and NRL coaches and sports trainers identified knowledge gaps in key aspects of on-field management and the importance of a graduated return-to-play.[11] International studies have recognised similar gaps in both coach and player knowledge.[12,13]

Involvement in sport is highly encouraged for children to improve health, fitness, confidence and teamwork skills. However it is crucial that sport is also safe for children who are rapidly developing both cognitively and physically. This study aimed to identify: (1) compliance with on-field management guidelines for concussion; (2) parent and player awareness of return-to-play guidelines; and (3) parent and player compliance with return-to-play guidelines supplied to them. We also planned to assess differences between sports, and between organised and unorganised sporting activities.

2. Methods

Children aged between 5 and 18 years presenting to the emergency department (ED) at The Royal Children's Hospital Melbourne (RCH) with sport-related concussion between May 2013 and November 2013 were recruited for the study. The RCH is a paediatric tertiary referral hospital and paediatric trauma centre for the state of Victoria, Australia, with an annual ED census of 82,000 patients. The study was approved by the RCH human research ethics committee.

Sports included both organised and non-organised sports, and included recreational activities such as motor-cycle and bicycle riding, skateboarding, horse-riding and ice-skating. Injuries sustained while playing on a playground or during games involving running but not involving a ball were not included.

We enrolled concussive injuries defined as a blow to the head resulting in one or more of the following: loss of consciousness, headache, vomiting, amnesia, disorientation, seizure or focal neurology.[5] We excluded lacerations or bruises to the head or face without concussive signs or symptoms.

Eligible children were identified at initial presentation to the ED. Verbal consent was obtained for initial data collection and follow-up phone call, which was completed with parents between 3 weeks and 3 months after recruitment. Refusal to participate would not impact on the patient's clinical management and parents/guardians were able to withdraw their child from the study at any time.

All families were provided with the hospital's return-to-sports fact sheet,[14] outlining the graduated return-to-play protocol recommended by the CISG 2008 Consensus Statement,[15] and a fact sheet providing general advice for head injury post-dicharge.[16]

Though both the CISG statement and head injury fact sheet were more detailed in their recommendations, we defined a patient as "compliant" with CISG on field management if they were removed immediately from play, assessed by qualified personnel and not allowed to return to play on the same day. We defined a patient as "compliant" with CISG RTP if they at least followed two of the steps of the step wise return to play and did not return to play while still experiencing symptoms.

Analysis was descriptive with categorical variables presented as percentages and 95% confidence intervals for relevant key percentages, and continuous variables described as mean and standard deviation or median and interquartile range according to their parametric or non-parametric distribution. Results for Australian Football (AF) and non-AF sports played were dichotomised.

3. Results

During the study period, there were 1115 head injuries (HIs) of any severity that presented to the ED. A total of 271 sport-related HIs among children aged 5–18 years were identified. Of these, 169 were missed during prospective recruitment, mostly while researchers were unavailable to approach patients for enrolment.

A total of 102 patients with sports related HIs were approached; 9 were excluded as they had soft tissue or neck injuries without concussive symptoms and 93 had concussion (the study group). No patient who was approached refused consent for participation. Of enrolled patients with concussion, 8 were lost to follow up. The average number of days until follow up was 32 ($\pm$5.2) days.

Demographics and signs and symptoms at presentation of the 93 enrolled children are presented in Table 1. Children arrived by ambulance in 50.5% of cases and apart from one patient arriving by air ambulance the remainder arrived in private car. Mean age of the children with concussion was 12.7 (SD $\pm$ 0.27) years. Sports played were AF (47.3%), soccer (11.8%), rugby (8.6%) basketball (7.5%) and other sports (24.7%). which included baseball, gymnastics, ice-skating, speed ice-skating, horse-riding, handball, hockey, taekwando, motocross, and riding a scooter, bicycle, skateboard or quadbike. Most children (81.7%) were involved in organised sports. Of the organised sports, 53.9% (95% CI 42.1–65.5%) were playing AF. Children had been competing in their sport on average 3.7 years (SD $\pm$ 0.3). Overall, protective equipment was worn by 51.6% (95% CI 41.0–62.1%), mainly mouth guards (41.9%) and helmets (12.9%). All participants were asked whether they wore a helmet at the time of injury, with only 2.3% of AF players and 22.4% of non-AF players wearing a helmet.

Signs and symptoms of concussions and management of children prospectively enrolled who were playing AF is compared with those playing non-AF sports in Table 1. The most frequent concussive symptoms and signs were headache (60.2%), and LOC (40.9%). Neuroimaging was performed in 18/93 (19.4%) of patients with none showing intracranial pathology. Forty-five percent were observed in a short stay unit (30.1%) or admitted to an inpatient ward (15.1%).

Important factors regarding on field management of concussive injuries are shown in Table 2. For most injuries a coach or medical staff attended and assessed the patient. Ten percent of patients did not report their head injuries at the time and were therefore not assessed on field. Symptom checklist use could only be determined definitively in ~50% of cases overall as 20% of patients did not know if the checklist had been used.