Special Focus: Sports & Exercise Medicine

Concussion: no longer a laughing matter in sport

Dr A Murray, Lt Col A Nicol, Mr I Murray, Dr J Robson

Introduction
For many years concussion has been a source of amusement in the sporting arena. Indeed, head and bone-jarring collisions are often celebrated by spectators, whilst players may have viewed concussion as a ‘badge of honour’. It would seem that it is only recently, and in response to high profile examples and emerging scientific reports of the short and long term sequelae of concussion and mild Traumatic Brain Injury (mTBI), that the sporting community is waking up to this problem. Conversely, the burden of these types of injury has long been recognised by the military, with the recognition of ‘shellshock’ during World War 1, while mTBI has been referred to as the ‘signature’ injury of the recent Iraq and Afghanistan conflicts (1). It is important that lessons from both the sporting and military arena are translated into good clinical practice to improve the care of our patients (2). A number of sporting organisations and governing bodies have now recognised the need to adopt strategies to prevent, recognise, and appropriately manage concussion, although this recognition and positive action is far from uniform. Put simply, in sport, concussion is still not taken seriously enough.

Epidemiology
Estimates place the annual incidence of TBI (including concussion) from sport at 1.5-3.8 million in the United States (3). Sports in which the participant is mechanically propelled, such as motor sports, cycling and skiing, pugilistic sports including boxing and wrestling, and collision sports including American football, rugby union and league, and ice hockey, place competitors at highest risk of concussion-producing forces, not all of which will result in concussion (4). Some governing bodies and organisations have collected injury surveillance data quantifying the risk of concussion, and risk factors for its occurrence. In rugby union, concussion is the third most prevalent injury, with an incidence in the professional game of 0.06 concussions/player/hour played; 72% of head injuries are sustained in the tackle (5,6).

Mild TBI and post-concussion syndrome (PCS) are common among military combatants, although symptoms are thought frequently to be due predominantly to psychopathological factors rather than a dominant neuropathological basis (7). It is noted that prior psychological distress and prior alcohol misuse are risk factors for acquiring mTBI; yet mTBI is often quoted as a major cause of mortality and morbidity in the wars in Iraq and Afghanistan, with estimates that 10% to 20% of returning US veterans have suffered an mTBI (2), although the prevalence of mTBI in UK military personnel is lower (7). Ongoing association with headache and dizziness is present, once psychopathological factors have been factored in (7). In a sporting context, concussion is frequently under-reported by players and likely under-diagnosed by medical and support staff.

Emerging insights must change the perception of sports concussion
Football manager John Lambie’s response in 1991 to being told that striker Colin McGlashan was concussed, and did not know who he was: “That’s great, tell him he is Pele, and put him back on”, now seems outmoded (8). Understanding of this condition has since evolved, and consensus statements for concussion in sport providing definition of the condition, diagnostic criteria, and appropriate management have been produced since the First International Consensus Conference in Vienna in 2001 and subsequent conferences in Prague and Zurich.

Concussion is defined in the Zurich Consensus Statement (2012) on Concussion in Sport as “a complex pathophysiological process affecting the brain, induced by biomechanical forces” and resulting in “temporary impairment of brain function” (9). Concussion can present with physical symptoms (headache, confusion), signs (amnesia, loss of consciousness), behavioural changes (irritability), cognitive impairment (slow reaction times) and sleep disturbance. No abnormality is seen on standard neuro-imaging, and loss of consciousness is not a requirement for diagnosis (4,9). The majority (80-90%)
of athletes with concussion sustained during sport are symptom free at 7-10 days (10,11). The ‘second impact syndrome’ or acute cerebral swelling, although uncommon, is a recognised and often fatal condition seen more frequently in younger athletes.

Several scientific papers have confirmed links between concussion and both short- and long-term neuro-behavioural, psychiatric and cognitive problems (4,12). Of the chronic conditions, chronic traumatic encephalopathy is well described, having been observed in boxers as far back as 1969 (13). A number of variables are being investigated to prove correlation with this condition, including previous exposure to acute TBI, concussion, length of career, and association with particular sports. Further studies looking at exposure and potential long-term consequences of concussion and acute mTBI in the military context would be welcome. Evidence suggests a link between contact sport and other neurodegenerative disorders such as Parkinson’s Disease, Motor Neuron Disease and Alzheimer’s Disease, as well as symptoms including chronic headache and mild memory impairment (4).

Management of concussion
Evidence-based principles on the management of sports concussion continue to evolve, and vary with participant age, activity, and level of competition. A player with suspected concussion must be removed in a safe manner and must not resume play on the day until concussion can be confidently excluded. If a cervical spine injury cannot be excluded, the victim should be treated with appropriate spinal precautions. The Sport Concussion Assessment Tool 3 (SCAT3) (14) is a tool that can be used to assist coaches, match officials, parents and health care professionals recognise concussion (15). A child SCAT3 (16) is available to assess younger participants. Participants should be medically assessed and those sustaining a concussion must go through a graduated return to play/ activity protocol (GRTP) and must receive professional medical clearance before returning to play. Amongst children and adolescents the recovery timeframe is likely to be longer, so a guideline of three weeks minimum before return to play is still in place (9). An expectation of full recovery if the right measures are taken can be emphasised to the person suffering the concussion.

More action required on concussion
Although some sporting governing bodies and the military in many countries have recognised the prevalence and dangers of concussion, an effective strategy focused on preventing, recognising and treating concussion optimally must be instituted across the board. Further adaptations to policies, laws and sanctions can discourage dangerous behaviours (17) whilst guidelines will continue to be refined and improved in response to emerging evidence. More research is required to further characterise short- and long-term risks, and inform preventive strategies.

Fundamentally, what is needed is a change in attitudes towards concussion in response to new scientific evidence. Service personnel, players, coaches, and support staff need to understand that concussion is not a benign process; it is a traumatic brain injury. Even though the majority are likely to make a full recovery, short- and long-term health problems can occur, and simple appropriate actions can prevent these. Effective grassroots education must offer complete clarity that the under-reporting, under-diagnosis and mismanagement of concussion can have short- and long-term health repercussions for the affected individual. Just as we would discourage participation with a damaged shoulder, we must similarly avoid continued exposure to harm with a damaged brain by removing any concussed individual immediately and managing a safe and timely return. Training for staff in relation to concussion should be prioritised at all levels. Personnel with adequate training and equipment to deal with the immediate care of these athletes should always be present in elite sport, while organisations offering training, information and support at a lower level will impact significantly on the problem of concussion.

Conclusions
Concussion related to sport or military action is a significant public health concern. Prevention, accurate diagnosis and appropriate management of concussion is imperative to minimise the risk of sportspeople and military personnel developing the acute and chronic disorders associated with the mismanagement of this condition. Although some organisations and sporting governing bodies have taken effective action, appropriate preventative and management strategies must be applied universally. What is required is a profound cultural shift, with athletes, service personnel, coaches, medical and other support staff recognising that concussion is an issue we should take extremely seriously.

References

Authors
Dr A Murray MBChB, MRCGP, MFSEM
Sports and Exercise Medicine Doctor.
The University of Edinburgh, UK. docandrewmurray@googlemail.com

Lieutenant Colonel A Nicol MBChB, FFSEM
Consultant in Sports and Exercise Medicine
Defence Medical Rehabilitation Unit, Headley Court, UK.

Mr I Murray MBBS, MBChB, MRCS
Clinical Lecturer in Trauma and Orthopaedic Surgery
The University of Edinburgh, UK.

Dr J Robson
Chief Medical Officer, Scottish Rugby Union, Murrayfield Stadium, Edinburgh, UK.
Centre for Sports and Exercise, University of Edinburgh.
46 Pleasance, Edinburgh, UK.