Head and neck injuries in football

Guidelines for prevention and management

National Health and Medical Research Council

NHMRC

Membership of the NHMRC panel on Head and Neck Injuries in Football

Canberra-based Core Panel

- Dr Ray Newcombe, (Chair), Neurosurgeon, President, Neurosurgical Society of Australasia
- Dr Robert Reid, Sports Physician
- Dr Robert Smethills, OAM, Medical Officer, ACT Rugby Union
- Ms Virginia Dove, Public Relations Officer, NHMRC
- Ms Claire Brady (Executive Secretary, September 1993– July 1994)
- Ms Sandra Twist (Executive Secretary, July 1994 – November 1994)

Medical Consultant Panel

- Dr John Crompton, Neuro-ophthalmologist
- Dr Paul Curtin, Plastic and Reconstructive Surgeon
- Dr Nathan Gibbs, Sports Physician, Medical Officer, Australian Rugby League
- Dr James Harmon, Epidemiologist, National Injury Surveillance Unit, Australian Institute of Health and Welfare
- Dr Siri Kannangara, Rheumatologist, Medical Officer, Australian Soccer Federation
- Dr Geoffrey Klug, Paediatric Neurosurgeon
- Dr Paul McCrory, Sports Physician, Medical Officer, Australian Football League
- Dr Glen Merry, Neurosurgeon, Chair, Trauma Committees of Royal Australasian College of Surgeons and Neurosurgical Society of Australasia
- Dr Cate Storey, Neurologist, Australian Association of Neurologists
- Dr Geoffrey Vanderfield, Neurosurgeon, Medical Officer, Australian Rugby Football Union
- Dr Roger Vanderfield, OBE, member of the International Rugby Football Board, former international referee
- Dr John Yeo, AO, Spinal Injury Rehabilitation

Head and neck injuries in football

Guidelines for prevention and management

Australian Football
Rugby Union
Rugby League
Soccer

Australian Government Publishing Service
Canberra

ISBN 0644 42932 1

Produced by the Australian Government Publishing Service

Contents

Overview of National Health and Medical Research Council report— *'football injuries of the head and neck'*

This booklet is based on the report of the National Health and Medical Research Council Panel on Head and Neck Injuries in Football. It includes key guidelines to be followed in the management of these injuries and the Recommendations made by the Panel. A summary of the Panel's main findings and activities is given below.

Injuries to the head and neck can be sustained in most sports, but this is more likely in the body contact/collision sports. Given the high participation rate in football in Australia, the risk of injury from football is nevertheless not as great as many would believe.

When discussing head injuries sustained in collision sports, a distinction needs to be made between the terms 'mild' or 'minor head injury' and 'mild concussion'. Similarly, concussion means different things to different people. Definitions with qualifications of these differences have been outlined in the report.

Most head injuries in football are minor. On the other hand, any head injury can be followed by complications. These injuries are more likely to occur after direct impact injury.

Head injury where consciousness is lost for a few minutes may be sufficient to cause measurable impairment of brain function for a variable period following injury.

Diagnosis on the field and management of brain injury is not simple for non-medical personnel. Players should not continue to play after they have been concussed. A defined procedure for referees, umpires and sports first-aid attendants has been recommended in the text.

The timing of returning to training and to play is also difficult to determine. The Concussion Guidelines provided should be of benefit for all codes of football.

Courses in early management of severe trauma have been promoted within Australia for medical officers likely to have to deal with trauma in an isolated setting. Similarly, guidelines for the care of head and spinal injuries have been produced by the Neurosurgical Society of Australasia and the Royal Australasian College of Surgeons and have been adapted to form the basis of the guidelines for the Management of Severe Head Injury and Neck Injury.

Apart from a prospective study on school rugby union, there is an absence of good overall data on injuries in football. Although useful for elite grades of football, injury studies on elite footballers cannot give a true representation of the risk of injury across the board. As a result, there is a need for uniform data collection and a national injury register in Australia. To this end, the information to be recorded in a Data Base for Surveillance of Head and Neck Injuries in Football has been specified.

Lacerations and contusions of the face are common in football. They appear to occur with greater frequency in elite and senior football. The risk of transfer of infectious diseases via bleeding wounds requires special precautions. Eye injuries include bruising and laceration around the eye socket, corneal abrasions, bleeding in the chambers of the eye and damage to the retina.

Fractures of the nose are common. Fractures of the jawbones and around the eye also occur. The high elbow in tackles is a common mechanism leading to such injuries.

The use of custom-fitted mouthguards and avoidance of high tackles are important factors in prevention. Mouthguards provide protection of the teeth, jaws and adjacent soft tissues. Mouthguards can also reduce the rate of concussion.

Neck injuries that may occur in football include soft tissue musculoskeletal injury, brachial plexus injury (shoulder and arm nerve injury), cervical spine injury and spinal cord injury. These result in a variety of injuries from the minor to the catastrophic - from simple sprains, 'stingers' and 'burns' to disc injuries, fractures, dislocations, paraplegia, quadriplegia and death.

Scrum injury, tackling injury, ruck and maul injury and open play accidents are all areas that require further attention. Substantial progress has been made towards prevention of these injuries by rule/law change, compliance, player selection and training, and general public awareness.

In Australia, the various codes of football do not require that participating athletes wear helmets. The paucity of evidence related to the use of helmets in football played in this country makes analysis of the risks and benefits of helmet use difficult. Soft head protectors and scrum caps appear to reduce lacerations and other soft tissue injuries and may lessen intracranial forces on impact. The view has been expressed that such soft helmet equipment should weigh no more than 80 grams. Further research into this area should be encouraged.

Available comparative concussion data for the various codes were studied by the Panel. From these data, it appears that concussion is more prevalent in the rugby codes and Australian football than in soccer. Further data concerning the incidence of all types of head and neck injuries in all codes, views concerning training and research, and administrative arrangements to minimise injury were also considered by the Panel.

Modified rules and laws for younger players reduce the risk of injury. Modified rules/laws also provide better training for young players, which in turn may help to reduce the risk when players reach senior grades.

In the management of school-age players, school teachers may need to be taught sports first-aid, in particular for managing concussion and other head and neck injuries. There is a similar need in junior non-school competitions, where it is desirable to have a sports first-aid trained attendant (or sports trainer or medical officer).

Research and education remain important regarding applications of rules and laws, types of foul play, player fatigue and equipment.

Illegal play is a major contributor to head and neck injuries and should be severely penalised. Elite players in particular, have a responsibility to set an example for younger players and should be heavily punished for breaching the rules/laws.

Recommendations

1. Management and Administrative Arrangements

(a) The official in charge of a football game should have the power to stop the game if a serious injury has occurred. Training to a sports-first-aid-standard certificate is desirable for all referees and umpires to enable them to conduct their administrative responsibilities. They are not required to manage the injury but only to ensure that the injury is managed.

(b) At every football venue, at every level, in every age group, the aim should be to have trained personnel, ie a person qualified in sports first-aid, and appropriate first-aid equipment for head/neck injuries.

(c) The frequency, duration and resetting of rugby union scrums, including a limitation on the number of times a scrum is reset, should be reviewed.

(d) Training and safety programs to reduce both illegal play and the effects of accidental injury should be continually promoted. Illegal play, especially above the line of the shoulder, is a major contributor to head and neck injury and should be severely punished.

(e) Player interchange which allows early intervention to assess injury should be considered by codes where this is not currently allowed.

(f) Appropriate practices and education to reduce the risk of blood contamination in contact/collision sports should be adopted in all football codes. Immunisation against hepatitis B is strongly recommended.

(g) Guidelines for the recognition of concussion and spinal injury should be promulgated to referees and umpires to enable them to conduct their administrative responsibilities.

(h) The finalised guidelines should be widely distributed to all clubs, coaches, medical practitioners and hospitals and reinforced with an education campaign.

(i) Common guidelines for concussion should be adopted by all codes. Retrospective grading of concussion, if utilised, should also be by a system agreed to by all codes.

2. Data Collection

(a) There should be a national registry of deaths, brain injury with permanent functional disability, and cervical spine injury (spinal injury with or without cord involvement) established, to commence data collection during the 1995 season.

(b) Such reporting or notification of injury should be the responsibility of each individual code of football. Initial reporting should occur at the completion of each game.

(c) Since concussion is so important, it is recommended that this be targeted for prospective research using uniform data coding. Guidelines for the management of concussion are recommended for adoption by all codes. Certification of recovery should be by a medical practitioner.

3. Equipment

(a) The use of custom-made mouthguards in contact sports, including football (all codes) is strongly recommended.

(b) Australian standards for mouthguards need to be developed.

(c) Possible obstacles to players such as goal posts, boundary fences and television cameras should be covered with soft material to reduce the possibility of serious injury should a player collide with any of these.

(d) Appropriate first-aid equipment designed to cope with head and neck injuries should be on-site wherever a football match is being played.

4. Research and Education

(a) Qualified sports trainers should have additional training in sports injury prevention and management. All football code administrators should encourage training and education as offered by the National Sports Trainers Scheme.

(b) Programs of prevention of head and neck injuries should include:
   (i) research into the selection of a player for a position according to body type;
   (ii) education of players, coaches, administrators and sports trainers; and
   (iii) research into specific aspects of fitness training, including neck muscle strengthening.

(c) Research into the use of soft head protectors or scrum caps to reduce injuries of the scalp, ears and face should be developed. Design criteria and manufacturing standards for such head protectors need development.

(d) Research should be undertaken to determine whether standardised soft head protectors reduce brain injury without creating other hazards.

(e) Video recordings of illegal conduct and play which results in injury in football games should be made readily available for research purposes.

(f) A central fund for specific research into the prevention and management of head and neck injuries in football should be established. In addition, administrations of each code should be encouraged to direct additional funds towards safety measures and the care of injured players.

Concussion guidelines

The following guidelines on concussion are adapted from those of the International Rugby Football Board (IRFB). In particular, changes have been made to the IRFB guidelines for return to competition. This Panel recommends that the following guidelines be adopted by all codes.

CONCUSSION occurs when, after a blow to the head, there is brain injury with some immediate disturbance of brain function.

Signs and symptoms of this may include:

- **confusion and disorientation**
- **loss of consciousness**
- **loss of memory**
- **double vision**
- **giddiness or unsteadiness**
- **vomiting**
- **headache.**

A player showing any of these signs or symptoms should be removed from the field and referred to a medical practitioner and should not be allowed to engage in further play until fully recovered.

IMMEDIATE MEDICAL ATTENTION IS ESSENTIAL WHERE THERE IS LOSS OF CONSCIOUSNESS.

Loss of consciousness for a period exceeding 4 or 5 minutes as a result of a blow to the head would be indicative of a more severe injury, therefore, the player **should be immediately referred to a hospital for further attention.**

POST-CONCUSSIVE SYMPTOMS INCLUDE

- **headache (with or without exertion)**
- lethargy
- fatigue
- irritability
- poor concentration
- giddiness
- nausea and vomiting especially in children
- gap in memory—memory loss after injury

Whether a player has memory disturbance or not can be readily tested by a simple daily assessment. The gap in time between injury and continuous memory afterwards is important.Some questions which are useful are:

- How old are you?
- What is your date of birth?
- What month are we in?
- What time of day is it? (morning, afternoon or night)
- What day of the week is it?
- What year are we in?
- What is the name of this place?

WARNING

Complications, potentially serious, may occur in the 24 hours after a seemingly slight head injury. Accordingly, deterioration of consciousness after apparent recovery or the onset of symptoms such as headaches, increasing drowsiness, blurred vision and vomiting require immediate medical assessment.

RETURN TO COMPETITION

Players who have suffered concussion with or without loss of consciousness:

- should not participate in any match or training session until they are fully recovered* and no longer have post- concussive symptoms, and have been cleared by a thorough medical examination (including examination of the central nervous system). During this period off, alcohol must be avoided;
- should undertake a non-contact exertional training session, when asymptomatic. This is to ensure that such exertion does not provoke a recurrence of symptoms;
- should not be given a medical clearance until after this training session.

** Some football codes have chosen a mandatory exclusion time for players with concussion and this has been found to be administratively acceptable.*

Management of severe head injury

At every football venue, at every level, in every age group, the aim should be to have trained personnel, ie a person qualified in sports first-aid, and appropriate first-aid equipment for head / neck injuries.

Prehospital care of severe head injury

The following factors require attention: airway, breathing, control of bleeding, prevention and treatment of shock, avoidance of factors which can either precipitate or aggravate raised pressure within the skull (the head-down position, low oxygenation of the blood, high carbon dioxide retention and vomiting), recognition of serious associated injuries especially spinal injury, effective communications and transport. It is essential to obtain and maintain adequate brain oxygenation and blood supply. All of these measures serve to reduce deterioration in brain and spinal cord function after injury.

Position of the unconscious patient

The LATERAL position is indicated for airway control. This does not apply in a patient with a suspected spinal injury, where the supine position is usually the position of choice, with the airway controlled and manual inline immobilisation is maintained by an attendant.

The lateral position is described as a position in which an unconscious victim lies on one side with the weight supported by the under shoulder, hip and the upper knee, which is at right angles to the hip. The face is turned slightly downwards to allow the tongue to fall forwards so that saliva or vomit will drain away.

On the field and in a stretcher-carry off the field, the trained attendant (fifth person) MUST walk at the player's head maintaining the airway and maintaining manual inline support of the head and neck.

In certain circumstances, special tubes may need to be placed through the mouth to the windpipe if the airway is inadequate. Such 'tracheal intubation' should be performed only by a competent medical practitioner or by an ambulance officer specially trained and certified in this potentially dangerous procedure.

Management of neck injury

Spinal injury

It is important to emphasise that, in a patient with suspected cervical spine injury with an obstructed airway, the immediate risk of low oxygen in the blood stream takes priority over the potential risk of spinal instability. If the person is unconscious, the tongue may passively fall backward, blocking the airways. A good airway can be restored by either the modified jaw thrust manoeuvre or by pulling the lower jaw forward (without inadvertently extending the neck) and then inserting an easily available special tube (oropharyngeal airway) designed to pass through the mouth to the throat over the tongue, whilst an assistant maintains the head in the neutral or inline position.

The mnemonic 'ABC'—

(a) airway with cervical spine control;
(b) breathing;
(c) circulation —should be adhered to.

A semi-rigid cervical collar such as the 'Stifneck' collar should be applied as soon as practical after cervical injury is suspected.

Management on the field

Whenever cervical spine injury is suspected: after protecting the airway (in line with regular guidelines for EMST), the head should be immobilised with the attendant's hands and maintained in the 'neutral position', ie aligned with the spine. Inadvertent movements of the neck must be prevented. It is particularly important not to flex the neck. For a stretcher-carry off the field, a minimum of five (5) people is recommended, one at each corner and one holding the patient's head and neck. The direction of travel for the injured player is feet first.

The preferred means of rapidly and safely immobilising the neck from flexion and extension is to apply a semi-rigid cervical collar, such as 'the Stifneck. Lateral cervical immobilisation also needs to be maintained. This can be accomplished using blanket rolls, blanket halo, Russell Extrication Device (RED) or other types of immobilisation boards.

Transfer after removal from field

Neurological deterioration may occur during transport. Wherever possible, patients with major spinal cord injury should go direct to Spinal Units from the field. Other patients with neck injury need to be assessed in the nearest appropriate medical facility with access to radiological equipment.

In many instances, initial care in a general hospital will also be indicated before transfer to a Spinal Unit is practical for patients that have suspected spinal cord injury.

Before transportation to hospital, the following important matters should be confirmed:

1. The airway is clear and 'guaranteed'.
2. Breathing (either spontaneous or assisted) is satisfactory. Supplemental oxygen is being administered. Airway tubes and other tubes are securely attached to the patient.
3. Neurologic assessment is completed and documented.
4. The entire spine has been immobilised securely for transport in devices such as the Russell Extrication Device and Stifneck collar.

The Russell Extrication Device is made in Australia and has been shown to be highly effective in the immobilisation and transport of patients with spinal injury.

The Jordon frame is also an Australian device which allows lifting, without 'moving' the patient, but is not an immobilisation device.

The 'scoop-stretcher' is a lifting device that is beginning to be used widely in elite football.

Equipment

The following equipment needs should be considered by each football code:

Player Equipment:

- Headgear
- Mouthguards
- Shoulder pads
- Boot studs
- Thigh pads

*Clothing

The Football:

- Shape and size of football — especially in relation to age of player
- Flight
- Weight
- Bounce
- Damping
- Air resistance
- Water absorption
- Shape retention
- Lacing

Football Ground:

- Surface of ground
- Goal post padding
- Field marking substances and appearance
- Padding on boundary fences and other potential obstacles

Injury Management:

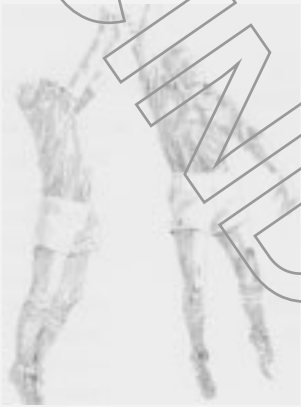
- First-aid equipment including:
  - stiff neck collar
  - Russell extrication device (RED)
  - Guedel airway
  - Oxyviva (bag and mask)
  - oxygen
  - stretcher

- Telecommunications:
  - mobile phone
- Educational materials:
  - laws
  - brochures
  - video instructions:
    'Neck safe',
    'Confidence in contact'
- Injury reporting system

Fatigue:

Head and neck injuries may be likely to occur in fatigued players. Factors implicated in fatigue are:

- dehydration
- glucose/glycogen levels
- salt levels
- clothing
- heat/cold.



Guidelines for future studies of head and neck injury in football

Future criteria for the collection of data concerning head and neck injuries in football may include:

- adequate and specific definitions of types of injury;
- the education of all data recorders in the implications of such definitions and tight control over data collection;
- definitions of soft tissue injury such as laceration and contusion being differentiated from bone injury and the potentially more serious injury to the brain and spinal cord;
- injuries to nasal structures, eye, ear, teeth and jaw being separately recorded;
- in the case of concussion, the standard classification of mild, moderate and severe being reviewed. This classification may be of benefit in hospital practice but has serious limitations on the sporting field; and
- injuries sustained at elite club level or representative level being differentiated from injuries at district level, and children's participation also being separately recorded and analysed.

Data base for surveillance of head and neck injuries in football

General injury data

The following information should be recorded in a general injury data base:

- Age
- Gender
- Date of injury (stage of season)
- Code played
- State/Territory in which injury occurred
- Match standard/level of play
- Ball carrier or not
- State of ground (hard, soft, etc)
- Illegal play in the injury-producing incident, with or without resultant penalty
- Phase of play
- Team position (usual or not)
- Specific training to prevent neck injury
- Stage of match at which injury occurred
- Description of injury
- How injury occurred
- Protective equipment used
- Treatment received/referred
- Time taken to receive treatment after injury.

Head injury

Collection of data should record and note the duration of symptoms in each of the following:

- **Diffuse Head Injury**
  - -Confusion and disorientation
  - Giddiness or unsteadiness
  - Vomiting
  - Loss of memory
  - Double vision
  - Headache
  - Loss of consciousness
- **Focal Injury**
  - Scalp/facial laceration—soft tissue
  - Skull fractures—position and type
  - Intracranial haemorrhage—extradural, subdural, surarachnoid
  - Cerebral contusion
  - Cerebral haemorrhage
- **Return to Play/Work**
  - Period off
  - Results of psychological evaluation, if performed.

Spinal cord injury

Other information, specific to spinal injuries, should be recorded in a spinal cord injury data base:

- Mechanism of scrum injuries - engagement, collapse, 'popping', etc
- Mechanism of non-scrum injury
- Financial settlement (amount)
- Neurological status at follow-up (less than two years) where applicable
  (Frankel gradings)
- Level of vertebral injury
- Nature of vertebral injury
- Neurological status at first examination.

CONCUSSION

Notes for Referees, Umpires and Coaches

There has been concussion if:

- The player is seen to have been unconscious for even the shortest time.
- The player was unresponsive for even the shortest time ie did not open his eyes, speak or get up at once.
- The player was confused for even the shortest time didn't know what to do, which way to play, where he was.
- The player was unsteady on his feet, reeling or unable to hold the ball.
- The player showed spasms or convulsions.
- The player has giddiness, double vision or vomiting.

The player must be able:

- to tell you:

  - the time, the day, the month, the year

  - the name of the other team

  -the score and how long the game has been going.

  - to walk steadily heel to toe.

Concussion often destroys judgment.
Do not allow a player to influence you.
The player's health and the reputation of the game is at stake.

OH the field:

As a part of team discipline, players must accept that, after being concussed, they must be seen by a doctor immediately-either at the site of the match or by being taken to the surgery or hospital by a responsible person.

After this has been arranged, whatever local arrangements there are for the management of mild head injury should be followed and the immediate responsibility of the game administrator ceases.

SPINAL INJURY

Notes for Referees, Umpires and Coaches

There has been a spinal injury (until proven otherwise) if:

- the player is unconscious
- the player has prominent neck pain
- the player has no sensation, or has pins and needles, in any limb
- the player is weak or cannot move the limbs below the site of the injury.

Note: If the player has received a prominent impact above the collar bone, the possibility of a spinal injury needs to be considered.