

The collapsed football player

The sight of a football player lying on the ground, surrounded by coaches and medics, is not uncommon.

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Football is the most popular sport in the world, played by over 265 million players and watched by about 3 billion people around the globe.¹

As the sport increased in popularity, so has the level of play and the resultant injuries. It is therefore not uncommon to find that a football player is lying on the field and that play has been discontinued.

Over 95% of all football match injuries are acute (and may be the cause of a collapsed player) and involve mainly the lower extremities.

There are several reasons why football players collapse or appear to have collapsed on the field. Injury is the most common reason, be it feigned, imagined, minor or severe. In a controlled match environment the referee will decide when the game should be discontinued to give medical attention to the collapsed player.^{1,2}

The subject of football injuries and their prevention has received considerable attention over the last 20 years. During the past 15 years F-MARC (Fédération Internationale de Football Association (FIFA)-Medical Assessment and Research Centre) has conducted an injury surveillance programme at all its major competitions. Also, data from studies published in reputable international sports medicine journals on injury characteristics, causation and prevention have been collected and reviewed.³

Over 95% of all football match injuries are acute (and may be the cause of player collapse) and involve mainly the lower extremities. The knee, ankle, thigh and lower leg are most commonly injured.¹ These are mainly joint/ligament injuries (30 - 40%), muscle/tendon injuries (20 - 25%) and contusions (15 - 25%). The majority (>60%) of these injuries are minor, resulting in fewer than 7 days off active play/training.¹

Causes of collapse

There are essentially two broad categories of causes of collapse, i.e. contact and non-contact injuries or medical conditions. Table I provides a summary of the possible causes.

Contact injuries

These commonly occur as a result of contact or a tackle with another player, either in a foul or non-foul situation, with or without the ball.^{1,2} Almost 50% of all contact injuries occur as a result of fouls

Table I. Possible causes of collapse in a football player

Contact injuries

Head injury

Concussion

Spinal injuries

Musculoskeletal conditions

Muscle contusions

Ligament sprains/ruptures

Fractures/dislocations

Other less common causes

Chest wall injuries

Blunt abdominal trauma

Blunt groin trauma

Subdural haematoma

Disasters

Natural - lightning injury

Spectator riot

Non-contact injuries/conditions

Musculoskeletal conditions

Muscle strains/tears

Ligament sprains/tears

Muscle cramping

Dislocations

Other (less common) medical conditions

Sudden cardiac arrest

Hyperthermia/heatstroke

Hypoglycaemia

Hypothermia

Exercise-associated collapse (postural hypotension)

and about 75% of these are sustained by the player who is tackled, while about 25% are sustained by the player doing the tackling.^{1,2}

Although most contact injuries are minor, some may be severe and can be life or career threatening. Cervical spine injuries, even though very rare in football, can have catastrophic consequences, especially if not properly handled in the acute phase. If mishandled on the field, an unstable fracture of the cervical vertebra may puncture and injure the spinal cord, resulting in permanent quadriplegia.^{4,5}

Head and neck injuries occur as a result of head-to-head, head-to-ground or elbow-to-head contact/clashes. These account for about 14% of all injuries and are generally minor, resulting in mild concussion (brain injury), but some may be severe, resulting in other severe cervical spine injuries and/or subdural haematoma and death.^{1,3,4,6} The incidence of severe head injury with concussion is fortunately very low (<2%).^{1,3}

Almost 50% of all contact injuries occur as a result of fouls.

Contact injuries may less commonly also involve other parts of the body, i.e. the chest wall, resulting in bruised or fractured ribs, especially with violent clashes. Another possible type of chest wall injury is commotio cordis. A direct blow to the chest wall (over the precordium) may trigger ventricular fibrillation and sudden death, without causing rib fractures.⁷ Other parts of the body that may be affected by blows that result in the collapse of a player are the abdomen and groin. Injuries to these areas are usually minor.

Some contact-type injuries may be caused by contact with objects other than fellow players, e.g. goal posts. In very rare circumstances a player might even be injured by flying debris from spectators or during natural disasters. This occurred in a recent football match played at Ellis Park, Johannesburg, where just before a storm a sudden gust of wind ripped out advertising billboards that flew around the field – striking and injuring a player and referee. In another match, also in Johannesburg, a number of players collapsed on the field after being struck by lightning. The match was subsequently stopped because of the storm.

Non-contact injuries

Non-contact injuries, on the other hand, occur without contact with another player or physical object. The majority of these involve injuries to ligaments and muscles (ligament sprains and muscle strains). These non-contact conditions may range from minor conditions, such as mild muscle cramps, to life-threatening cardiac arrest and sudden death on the field.⁷

Muscle cramps is a common phenomenon in football. The cause of cramping is not well understood. However, a popular hypothesis is that cramping occurs as a result of altered neuromuscular control in a fatigued muscle.⁸ This theory is

supported by the fact that football players usually suffer from cramps at the end of the second half or during extra time, i.e. when muscles are fatigued.

Medical conditions

The non-musculoskeletal and non-contact type conditions, e.g. exercise-associated collapse (EAC), are very rare in football and are more common in endurance-type events such as marathon running.^{9,10} EAC is thought to be due to postural hypotension as a result of sudden cessation of prolonged exercise activity.^{9,10}

Heat-related conditions such as hyperthermia/heat stroke, although rare, can occur if football is played under extreme environmental conditions (high temperatures and humidity), especially if players are not acclimatised to such environments.^{1,9}

Symptoms and signs of heat stroke include:

- headache, dizziness and fatigue
- decreased sweating
- hot, flushed and dry skin
- increased pulse and respiratory rate
- collapse and convulsions in severe cases.

Although not a common condition among footballers, a poorly controlled diabetic player may collapse owing to hypoglycaemia associated with heavy periods of exercise. Hyperglycaemia has also been recorded after intense exercise in type 1 diabetics.¹

Of all the non-musculoskeletal and non-contact conditions, sudden cardiac arrest is the most serious cause of collapse as it can result in death within minutes.⁷ Fortunately, sudden cardiac death (SCD) on the field is rare. Its incidence is estimated to be 1 - 3 per 100 000 athletes.⁷ However, when it does occur, it attracts a great deal of media attention and is often not a comfortable experience for a team physician. A recent tragic event in football was the sudden collapse and death of the Cameroonian star, Mark Vivien Foe, which prompted a renewed campaign by F-MARC to prevent such events in football.

SCD is defined as 'death occurring within 1 hour of the onset of symptoms in someone without a previously recognised cardiovascular abnormality, excluding respiratory, cerebrovascular and drug-related deaths.'⁷

The commonest cause of sudden cardiac arrest in persons <35 years old is an underlying cardiac abnormality, such as hypertrophic obstructive cardiomyopathy

(HOCM).^{7,11} Other common causes include arrhythmogenic right ventricular cardiomyopathy, dilated cardiomyopathy, and congenital coronary artery anomalies.⁷ Less common causes include aortic rupture in Marfan syndrome, myocarditis, valvular disease (aortic stenosis, mitral valve prolapse) and the ion channelopathies (long QT syndrome, Brugada syndrome, catecholaminergic polymorphic ventricular tachycardia), and blunt chest trauma causing malignant arrhythmia (commotio cordis).^{7,11} Other causes of arrhythmia, such as the stimulant drugs (antihistamines, strychnine, cocaine), may also cause SCD. In persons >35 years of age the primary cause of death is coronary artery disease.⁷

SCD occurs in previously apparently healthy and fit individuals and can also occur in recreational players, including coaches. Physical activity, particularly in short, intense bursts, as in football, can precipitate an event in someone with a known underlying genetic disease. The causative mechanism is thought to be malignant arrhythmias – ventricular tachycardia/fibrillation.⁷ The contributory mechanisms are thought to be:

- ventricular tachyarrhythmias (abnormal myocardium/fibrous tissue)
- bradyarrhythmias (conduction defects)
- dissection of the great vessels (Marfan syndrome).⁷

As SCD occurs in previously apparently

Muscle cramps is a common phenomenon in football.

healthy individuals, there are usually no symptoms of note. Possible warning symptoms (if they do occur) are palpitations, dizziness, angina, dyspnoea or syncope.^{7,11} It is logical, therefore, to focus on prevention of SCD rather than on treatment, because by the time sudden cardiac arrest occurs it may already be too late. Prevention of SCD can be subdivided into primary and secondary prevention.

Primary prevention entails thorough medical screening of all young football players as in the pre-competition medical assessment (PCMA). The FIFA Medical Commission encourages preventive screening by means of the following:

- thorough history
- physical examination

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- 12-lead electrocardiogram (ECG)
- echocardiography (in the case of a positive history, examination and/or ECG findings).^{1,7,11}

Those found to have high-risk conditions such as hypertrophic cardiomyopathy will generally, according to the Bethesda guidelines, have to be excluded from participating in active professional football.¹

Secondary prevention entails immediate cardiopulmonary resuscitation and defibrillation. The latter should take place within 1 - 2 minutes for the best success rate.^{7,11}

Management of the collapsed player

Management of a collapsed player does not start with on-field assessment and first-aid treatment. The team doctor's primary role is to care for the player, even *before* the collapse. It is important, therefore, to screen all players before the start of the season and to clear all players as fit before each game.^{11,12}

A comprehensive cardiology screening at age 16 - 17 years or at entry into the team will go a long way in minimising chances of collapse and sudden death from cardiac causes. Appreciating the limitations in some communities, screening questions when taking a history may highlight young players who should be referred to centres where they may be further evaluated.

Paying attention to all potential risk factors for musculoskeletal injuries will also reduce the chances of non-contact musculoskeletal injuries,¹ e.g. ankle taping before games in the case of high-risk players and adequate rehabilitation of injuries before allowing players to return to full play.

The team doctor also needs to be prepared for any eventuality before any game. He/she needs to have adequate knowledge and experience of emergency sports medicine to anticipate and administer emergency treatment.^{11,12} To this end FIFA/F-MARC is in the process of publishing a football emergency manual for publication and distribution before the 2010 FIFA World Cup South Africa™.

It is important for the sideline team doctor to have a full view of the playing field to see what may have happened before a player collapses and to have a clear view of any player collapsing. By the time the team doctor is called onto the field, he/she should have reasonable answers to the following questions:

- What was the mechanism of injury (if any)?
- Was there contact with another player/object?
- What is the possible differential diagnosis?

Rules for entering the field

As in any other sport, football is governed by specific rules and regulations. There are also rules applicable to members of the technical team, including the team doctor. These rules, among others, dictate that members of the technical area must behave in a responsible manner and that the team doctor or physiotherapist can only enter the field at the invitation of the referee.^{1,2}

In the event of a player collapsing, the referee will stop the game and signal for the medical team to proceed onto the field. With the exception of severe injuries/conditions and/or any injury involving the goalkeeper, the medical team must stabilise and transfer the player from the field of play as soon as possible. A more comprehensive assessment and definitive treatment can only be undertaken on the sidelines or in the stadium's medical centre.

Assessment of the collapsed player

The first phase of assessment of any collapsed player will start with observation of the circumstances around the physical collapse. When the team doctor arrives at the player's side, there should be certain clues pointing to a differential diagnosis. With more serious causes, e.g. head injuries, the on-site assessment will include a quick assessment of the level of consciousness, status of the airway, breathing and circulation.^{5,13}

With severe injuries, the referee will normally allow enough time for the medical staff to assess and safely remove the collapsed player from the field of play. In one incident in Cape Town, a helicopter was allowed to land on the field of play to evacuate a seriously injured player to hospital.

For players with serious head, neck or cervical spine injuries, extra care must be taken to ensure that the neck is safely secured before the player can be loaded onto an appropriate spinal board and moved from the field. The neck must be stabilised in such a way that any unnecessary movement of the vertebral

column is avoided, e.g. with a rigid cervical collar. A quick assessment of motor and sensory neurological function should be made as a baseline for further management.^{4-6,13}

A collapsed player with possible concussive brain injury should have a quick neuropsychological examination. Ask simple questions to test short-term memory. These include naming the opposing team, the score, whether it is the first or second half, the score in the last game played, etc.^{1,3,6} Concussed players should also be assessed for spinal injuries.

More about spinal stabilisation

- If conscious, the player must be instructed not to move from the position in which he/she is found upon arrival of the team physician.
- One health care provider must be asked to stabilise the player's head and neck by placing one hand on either side of the head and preventing any uncontrolled movements.
- If practical and appropriate, an attempt must be made to gently place a rigid cervical collar or equivalent around the player's neck to stabilise the cervical spine.
- If the player is standing, he/she must be fully secured to a long spinal board (or equivalent) before being slowly and carefully lowered into the horizontal, supine position on the field.
- If the player is lying in the prone position, he/she must be carefully log-rolled onto a long spinal board (or equivalent) so that he/she is positioned horizontally in the supine position. The player is then adequately secured in this position before being transferred.
- If the player is found in the supine position, the team of health care providers must simultaneously lift the player, controlling the neck, while a long trauma board is positioned under the player, who is then lowered gently onto the board to be secured before transfer.

Any player who suddenly collapses without contact with another player or object and lies unconscious on the field should be suspected of having suffered cardiac arrest until proven otherwise. Cardiopulmonary resuscitation (CPR) should be started immediately, even before an automated external defibrillator (AED) can be made available. Defibrillation administered in

less than 2 - 3 minutes can provide a survival outcome of about 50%; however, rates fall sharply with each minute thereafter. By 4 - 5 minutes survival is 25% or less, and less than 10% after 10 minutes.¹¹

Role of the event/venue doctor

The event/venue doctor plays a critical role in ensuring the following:

- that appropriate emergency equipment for neck stabilisation and transportation of injured players off the field is immediately available at the sideline, as well as a range of emergency medications that should include glucose in various forms for hypoglycaemia
- that there are appropriately experienced emergency medical personnel available at the sideline
- that there is a fully functional manual or automated defibrillator available at the sideline or within a defined time period of less than 3 minutes
- that there is an appropriate emergency ambulance on standby to evacuate a seriously injured player to hospital
- that the receiving hospital is notified well before the game and is on standby, not only to receive a seriously injured player but also to respond to disaster situations.

Of all the non-musculoskeletal and non-contact conditions, sudden cardiac arrest is the most serious cause of collapse as it can result in death within minutes.

Return-to-play guidelines

The decision to allow the (collapsed) player to continue with play is often not a straightforward one for the team doctor. It will depend largely on the severity of the injury, and every case should be treated

on merit. This decision needs to be taken very quickly (within 1 - 2 minutes). The team coach must be notified and allowed to make decisions with regard to possible substitutions and/or rearrangement of player positions.

Concussed players should also be assessed for spinal injuries.

In the case of a musculoskeletal injury, the following principles apply:

- there is pain-free range of motion around the joint(s) involved
- there is no joint instability or significant weakness of muscles involved
- continuing with play will not worsen the sustained injury.

This may however often be complicated by other factors, such as:

- a player masking pain so as to be allowed to continue playing
- no more substitutions available at the time of injury.

The team doctor should be guided by the sound ethical principle of always acting in the best interest of the player and must not take any decision that cause further harm to the player.^{1,13}

Players showing signs and symptoms of concussion should not be allowed to continue to play. Such players need to be further evaluated and monitored.

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In a nutshell

- Fortunately, most of the causes of collapse are minor.
- The majority of these are due to minor contact or non-contact musculoskeletal injuries.
- Although rare, more serious contact injuries such as cervical spine injuries can be career or life threatening.
- Careful sideline assessment and management of these severe cases is necessary to avoid further injury and/or permanent loss of function.
- The most effective way of preventing sudden cardiac death is cardiovascular screening by means of thorough pre-season or pre-competition medical assessment.
- The more serious causes of collapse can be averted or mitigated by a collaborative effort from the players, support personnel (team doctor, event doctor, emergency medical personnel, security personnel, etc.) in ensuring that there is meticulous planning for games and that the players have been cleared fit to play.