Polytrauma and the Unconscious Athlete

16

Daniel Mahr and Himanshu Bhayana

16.1 Introduction

Polytrauma, multiple trauma, severe injury, or major trauma in medicine is defined as severe injuries of different body parts sustained in a single event, with at least one injury or the combination of multiple injuries being life-threatening. In correlation to mortality, morbidity, and hospitalization time, the Injury Severity Score (ISS) is established to assess trauma severity. Polytrauma is defined as an ISS greater than 16.

The type of sports activities that can lead to serious injuries are classified into three broad categories:

(a) Sports involving falls from high altitude (e.g., climbing, paragliding, horseback riding)
(b) Sports causing high speed trauma (e.g., cycling, skating, skiing, equestrian sports, and motorsport)
(c) Sports involving high levels of intrinsic energy (e.g., martial arts)

Successful care of severely injured athletes requires well-equipped primary caregivers who have the responsibility for preclinical assessment and providing preclinical care before and during transfer of the patient to the medical care center.

16.2 Preclinical Assessment

16.2.1 Rescuer

Preclinical care begins with the alert of a suitable designated rescuer. As a rule, a paramedic is mandatory to manage a seriously injured patient in accordance to the established guidelines. A suitable rescue device for patient transport must always be available (e.g., rescue helicopter).

16.2.2 Vital Signs

Initially, the neurological status is recorded to see if the patient is coherent and oriented and follows verbal commands. If the injured person does not respond to the oral commands or painful stimuli then breathing and circulation are checked. It is critical to observe whether the breathing is spontaneous or needs assistance. Circulation is best assessed by carotid pulse examination. If there is no circulation, resuscitation must be started and continued as per the basic life support guidelines until professional assistance arrives. If the athlete

D. Mahr (✉)
Department of Trauma Surgery, Caritas Krankenhaus St. Josef Regensburg, Regensburg, Germany
e-mail: daniel.mahr@gmx.de

H. Bhayana
Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

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is unconscious or in altered sensorium with normal breathing and circulation, then the injured person is closely monitored until the requested medical assistance arrives.

16.2.3 Positioning of the Athlete

After the initial assessment of vital parameters, the injured person must be positioned in such a way that a complete examination of the body and the stabilization of vital functions are feasible. Supine position is the position most commonly used. In case of an injured athlete wearing a helmet, the helmet is best removed with the help of an assistant. One person has to make sure that the cervical spine is stabilized while the other person carefully removes the helmet. To negate the possibility of missed injuries, the person is adequately exposed and undressed in a safe and adequate environment

16.2.4 Examination

Based on the Advanced Trauma Life Support(ATLS) algorithm, the clinical examination follows the sequence of A.B.C.D.E.

A (Airway and Cervical Spine Protection)
It is imperative to establish that the airways required to carry out breathing are patent and free of any obstruction. Blood, vomit, and foreign bodies as well as facial and upper airway injuries can interfere with the airway. If the airway is obstructed, it must first be cleared. The primary responder should be adequately trained in providing chin lift or jaw thrust for airway clearance. At the same time, immobilization of the cervical spine should be done with rigid neck brace should take place. Endotracheal intubation or cricothyroidotomy should not be delayed if the airways are not clear.

B (Breathing and Ventilation)
Airway patency is not a guarantee for adequate ventilation. Proper functioning of the lungs, chest, and diaphragm is essential for respiration (gas exchange). Examination of the thorax involves inspection, auscultation, percussion, and manual examination of the chest. Injuries that can significantly compromise gas exchange include thoracic bleeding, tension pneumothorax, flail chest, and pulmonary contusion. Primary responders should know when and how to decompress tension pneumothorax with a needle if necessary. Open chest injuries should be closed as soon as possible and an AMBU bag or endotracheal intubation should be ready whenever necessary.

C (Circulation and Bleeding)
Severe injuries can lead to internal or external bleeding which can lead to hypovolemic shock. This can create a situation where the adequate amount of blood is not being pumped to vital organs; especially the brain. Internal bleeding is immediately compensated with saline or blood transfusion. External bleeding should be addressed by manual compression or MAST. Hemorrhage shock is clinically manifested by decreased blood pressure, rapid thready pulse, increased heart rate, increased capillary refill time (>3 s), unconsciousness, and pale skin color.

D (Disability and Neurologic Status)
A focused neurological examination indicates the extent of impact of injury on the individual. Consciousness status, pupillary reflexes, and size, and possible injury to nerves are assessed. To determine the severity of brain injury, the Glasgow Coma Scale is established (Table 16.1).

E (Exposure and Environmental Control)
The person is adequately exposed while taking precautions to maintain dignity of the person involved and simultaneously preventing hypothermia. A significantly reduced body temperature can result in a coagulation disorder and can worsen the possible bleeding situation. The temperature is assessed by feeling the skin or using a thermometer if available.

Table 16.1 Glasgow Coma Scale (GCS)

Assessment area	Score
Eye opening (E)	
Spontaneous	4
To speech	3
To pain	2
None	1
Verbal response (V)	
Oriented	5
Confused conversation	4
Inappropriate words	3
Incomprehensible sounds	2
None	1
Best motor response (M)	
Obeys commands	6
Localizes pain	5
Flexion withdrawal to pain	4
Abnormal flexion (decorticate)	3
Extension (decerebrate)	2
Non (flaccid)	1

The grading is done as follows: Minor Brain Injury GCS 13–15, Moderate Brain Injury GCS 9–12, Severe Brain Injury 3–8 [1]

16.3 Transport to an Appropriate Trauma Center

After appropriate stabilization, the injured athlete needs to be transported carefully to a suitable trauma center for further management. In order to prevent additional damage during the transportation a vacuum mattress is used. Simultaneously to the transportation, history of injury and relevant medical conditions should be transmitted to the recipient trauma center so that the center is well informed and prepared to receive the injured athlete. In the trauma center, the clinical reevaluation of the patient and relevant diagnostic investigations are carried out. On the basis of the findings, a decision is made for further medical treatment.

16.4 Main Pathologies and Injuries in Multiply Injured Athletes

The incidence of injury in descending order in athletes during sports is as follows: Limb injuries > head and brain injuries > chest injuries > abdominal injuries > pelvic injuries > spinal injuries. These injuries can occur in isolation or in any combination with varying severity.

16.5 Treatment Options

The primary caregiver to the severely injured athlete is usually a non-medical helper. Professional medical staff is only present at professional competitions and sports festivals. In case of severe injuries, the first and foremost priority should be to provide appropriate basic life support (BLS). The importance of BLS cannot be overemphasized. The assessment of injured athletes on training fields or in sports stadiums leads to the decision if hospitalization is necessary or not. Additionally, the initial assessment evaluates if the patient's condition is stable or not. Depending on the patient's condition, it is to be determined whether an immediate/rapid transport to the hospital is necessary (head injury, abdominal injury, etc.), called "scoop and run" or a "stay and play" is possible. Early response by rescue team and the immediate transport to a trauma center is extremely essential for the outcome of the polytrauma patient. It is essential to stop the play immediately so that the response of the rescue team is not delayed. Early response hastens the long-term recovery and return to sports activities.

Typical clinical symptoms and monitoring signs for an unstable patient are:

1. Tachycardia (increased heart rate)
2. Hypotension (fall in blood pressure)
3. Tachypnea (increased breathing rate)
4. Increased capillary refill time (>3 s)
5. Cold and clammy skin
6. Unconsciousness

16.6 Prevention Programs or Preventive Gear

Protective equipment such as helmets, neck protection, spinal protection, protective suits, restraint systems, and airbags can significantly

minimize but not completely prevent the impact of great forces on the body. Intense matches can cause the athletes to push the limit beyond their comfort zone, which can lead to fatigue-induced injuries. So training and experience with extreme situations is necessary and the athletes should be prepared for such situations.

Additionally, the athlete should know their vehicle in motorsports and their horse in equestrian sports. The importance of general training and adequate warm up cannot be under estimated for prevention of severe injuries.

National trauma networks are established which document the trauma rate in each country in the national registry. This can indicate the prevalence of trauma burden and enhance future approaches for prevention. The most important factor that directly correlates with the patient's outcome is the time from the accident to the initiation of the necessary therapy.

16.7 Rehabilitation Guidelines

Rehabilitation for severely injured athletes depends on the type and extent of the injury and is essentially integrated into the national rehabilitation programs. Every injury affects an athlete both physically and psychologically. Although physical discomfort is apparent at large and is easily measurable, the psychological impact the injury causes in terms of missed tournaments or upcoming season matches influence the recovery of the person. Appropriate psychological guidance and counseling is extremely important to build the morale of the athlete so that he is mentally and physically fit to resume his practice and resume sports as the pre-injury level.

In case of higher injury severity or multiple injured body regions, a hospitalization and a longer time-out in sports is expected. In these cases, an early functional training of the injured body region, maintaining the training of uninjured body regions and in general, an early mobilization of the patient is essential to avoid muscle atrophy and joint stiffness as well as to facilitate the earliest possible return to play.

16.8 Pitfalls

- An unconscious athlete is an emergency, and it requires medical personnel to be available for immediate attention and care.
- The severity of the injury can be underestimated, especially if there is no obvious external injury (head injuries).
- After a serious accident, the injured person must be continuously monitored.
- Patients with head injuries, even if initially inconspicuous, can rapidly deteriorate into life-threatening condition.
- Patients with possible spinal injury should be carefully transported to a trauma center.
- Patients with thoracic injury can suffocate and bleed to death.
- Patients with abdominal injuries and pelvic injuries may bleed to death although no external injury is visible.

16.9 Fact Box

- A serious accident in athletes is an emergency and must be handled by trained medical personnel.
- A standardized examination procedure and treatment algorithms are essential for seriously injured persons.
- A seriously injured person must be transported gently to an appropriate trauma center.
- High energy trauma to the body can lead to injuries that are not visible from the outside.

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