Management Of The Critically Injured Football Player

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Abstract: *Evaluation and treatment of a football player who has sustained life-threatening injuries is a rare but significant challenge for the sports medicine team. Early recognition and intervention in these injuries is crucial. Helmets and shoulder pads complicate management of these patients. In this article, I present a rapid and simple assessment method used by paramedics for trauma patients. Treatment focuses on when football equipment should be removed and how the equipment complicates Advanced Life Support measures. A strong, working relationship with Emergency Medical Services is encouraged.*

During my career as an athletic trainer and paramedic, I have found myself on both sides of the debate over removing football equipment. Athletic trainers traditionally have been taught to never remove the equipment, while Emergency Medical Services (EMS) personnel have been taught to always remove equipment. I do not believe that either argument is correct; nor do I believe that either argument is wrong. A recent article in the *Journal of Athletic Training* questioned the proper method of gaining access to a player's airway.[17] These comments are appropriate and allow athletic trainers to examine their procedures and preparedness for dealing with these types of injuries. However, this recent examination of emergency treatment procedures was limited to face-mask removal. In this article, I examine the total picture of managing a critically injured player, with emphasis on a means of rapidly assessing the player and how football equipment complicates management.

I shall define critically injured as "experiencing respiratory distress, loss of consciousness, or sudden cardiac arrest." Cervical spine injury is assumed in all cases. The issue before us is: when to remove the equipment. We must assess the player in order to determine the extent of his injuries, and we must treat those injuries. The helmet and shoulder pads must be removed at some point.

It is my belief that the helmet and shoulder pads should be removed on the field if and only if the player presents with critical injuries as defined. An examination of the pathophysiology of these injuries is necessary before we can examine a method of assessment.

Pathophysiology

The mechanism which causes an athlete to present as a critically injured patient is varied. Respiratory distress may be caused by foreign-body obstruction, closed-head injury, high cervical-spine injury, pneumothorax, or underlying medical problems, such as asthma or anaphylaxis. Loss of consciousness is usually related to head injuries, but could be caused by hypoglycemia, drug overdose, hyperthermia, or stroke. Sudden cardiac arrest is usually secondary to an ischemic event, but may be caused by anoxia, neurologic insult, metabolic disturbances, or a combination.[18] While this list is not all-inclusive, it does include most of the major possibilities. Many of these causes do not apply to a young, healthy athlete. Regardless of the cause, the possibility of any critically injured athlete's condition degenerating into cardiac arrest is the worst possible scenario. The exact mechanism is varied, but is usually related to anoxia.[18] Anoxia alters the cardiac conduction system and allows ventricular escape beats to occur; decreased stroke volume and hypotension result. Perfusion of the myocardium is reduced, and ischemia occurs. Catecholamine release further lowers the threshold for ventricular ectopy, and ventricular fibrillation or asystole are the usual end result. The vast majority of cases will present with ventricular fibrillation.[18] Successful resuscitation is directly related to the time from onset of ventricular fibrillation to defibrillation.[1,5]

Neurologic causes of cardiac arrest can be of two types: 1) The cervical spine injury occurring above the C-4 level will affect the phrenic nerve and result in decreased respiratory effort from loss of diaphragm function[8]; or 2) Cardiac arrest may be immediate in the case of a C-1 fracture-dislocation, or may occur much later with lesions in the region of C-4.[10] Expanding intracranial lesions will result in hypertension and bradycardia.[4] Assume that all patients with severe head injuries have cervical spine injuries until proven otherwise.[3,4,6,7,9,15]

The constant theme throughout is to quickly identify anoxia and intervene in order to properly ventilate the patient. Preventing an unstable condition from degenerating into cardiac arrest is the goal.

Assessment

Assessment of all injured athletes begins with ABCs. This assessment has been expanded and can be considered as ABCDEs.[14]

Airway and Cervical Spine. Assess the athlete to determine airway patency.

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Stabilize the cervical spine simultaneously. Keeping the cervical spine in an in-line neutral position is required throughout evaluation and management. Removal of the mouthpiece is a high priority. If the airway is not patent, immediate steps to ensure patency, such as a jaw-thrust maneuver, must be performed. Consider inserting an oral airway if a gag reflex is absent.

Breathing. Breathing should be spontaneous and of adequate depth and rate to maintain proper ventilation. A rate of less than 10 or greater than 30 breaths per minute calls for assisted ventilation. Lung sounds should be auscultated (evaluated with a stethoscope) by a qualified person as soon as possible.

Circulation. Determine pulse rate and quality. An initial rapid pulse rate is most likely a normal variant in athletes. Repeated assessments of the rate are indicated to determine how quickly it returns to normal. Absence of a radial pulse indicates that the patient has decompensated and is in serious difficulty. Assess capillary refill and skin temperature, also, to provide an indication of tissue perfusion. Bleeding should be identified and controlled if it is extensive. Blood pressure can be estimated by pulse measurement. If there is a carotid pulse, the systolic pressure is above 60. If the femoral pulse is present, the systolic pressure is between 70 and 80. If the radial pulse is present, the systolic pressure is above 90.[4] At some point, blood pressure should be auscultated. This may occur during transport to the hospital.

Disability. Measure the level of consciousness in terms of the athlete's response to verbal or painful stimuli. Examine pupils for size, equality, reaction, and accommodation to light. Also, determine movement and strength in the extremities.

Expose and Examine. Examination of the chest and abdomen necessitates the removal of some clothing and equipment. Complete removal of the shoulder pads may not be necessary, based upon clinical findings. However, any athlete complaining of chest pain or dyspnea needs to have his chest exposed in order to assess lung sounds, as previously mentioned, and needs to be placed on cardiac monitoring as described later in this article. Cold weather must be considered when exposing large portions of the body, and measures to protect against hypothermia should be taken. Modesty may be considered, but, under no circumstances should it limit the examination.

This assessment can be accomplished in less than 30 seconds by trained personnel. Indeed, many of these steps can be conducted simultaneously, and an experienced team approach will allow completion of the assessment within seconds. Any positive findings detected during this examination should be corrected immediately. Results of this assessment determine how the player is managed.

Trauma triage guidelines vary by locality. The guideline for the 11-county region surrounding Pittsburgh considers spine injuries alone as meeting the criteria for transport to a Level I Trauma Center (Emergency Medical Services Institute, unpublished document, 1988). The Champion Trauma Score is a more universal scoring system and does not consider spine injuries in the absence of decreased level of consciousness, hypotension, or dyspnea to indicate transport to a trauma center.[14] In either case, the decision of how to remove the athlete from the field must be made quickly by the sports medicine staff.

Management

The management of critically injured football players must be a team approach, involving the athletic trainer, the team physician, and EMS. Treatment consists of airway management, oxygen administration, cervical spine immobilization, intravenous access, and cardiac monitoring with defibrillation and drug therapy in the event of cardiac arrest. Of these treatments, football equipment complicates airway management, cardiac monitoring, and defibrillation. Let us examine these in more detail.

The face mask does not hinder evaluation of the airway, but it does hinder treatment. Assisting respiration with a bag-valve mask and an oral or nasal airway is the initial treatment of choice, if ventilation is inadequate. Endotracheal intubation is the definitive measure for airway control.[4,14] This can be accomplished via the nasal or oral route. Both procedures have limitations and are not without controversy[9,15]; however, these topics are beyond the scope of this article. Removing the face mask is necessary to conduct any of these measures efficiently. Putman[17] suggested different ways of face-mask removal and raised concern about speed and efficiency in performing this procedure. Letters to the editor in subsequent editions of the *Journal of Athletic Training* added to this concern and offered other alternatives.[12]

Cardiac monitoring of these patients is necessary and requires access to the chest. Electrodes are applied to the right and left clavicular regions and to the left side of the chest in the midaxillary line below the nipple. Cutting the jersey, shoulder pad strings and straps, and any shirt worn under the pads will be necessary. The skin should be dry.

Defibrillation of a football player is more complicated. The chest must be completely exposed and dry in order to ensure operator safety. Place paddles below the right clavicle and over the apex of the heart (Fig 1). This cannot be done safely with the shoulder pads in place. Sweat-soaked pads could conduct current and result in arcing of the charge, resulting in ineffective delivery of countershock, burns to the patient, or accidental defibrillation of the operator. Personnel could now be faced with two patients instead of one. Shoulder pads must be removed before defibrillation.

This leaves the athletic trainer with a dilemma. Equipment must be removed in order to treat the athlete in cardiac arrest or the unstable athlete who may arrest at any moment. This is done in the face of a cervical spine injury. All tasks must be accomplished quickly; however, I have found no literature dealing with this situation. Helmet removal has been treated on an "as needed" basis, but only O'Donoghue mentions defibrillation. Further, only Arnheim notes to remove the shoulder pads to perform CPR.[2,3,6,7,11,16,19]

In the case of a football player in cardiac arrest or a player with injuries that increase the chances of cardiac arrest, I propose that the helmet and shoul-

der pads be removed, while keeping the cervical spine in an in-line neutral position. This procedure is not as difficult as it may sound and can be conducted quickly, if practiced. I must emphasize that this does not apply to players with cervical spine injuries without respiratory or cardiac involvement. Those athletes may be immobilized effectively with all equipment in place, and face mask removal is not always necessary.

If the helmet is removed without removing the shoulder pads, the cervical spine will be placed in an extended position because the shoulder pads lift the thorax. This position defeats the purpose of in-line neutral stabilization, which is essential. Removing equipment is an all-or-none proposition.[7]

We suggest the following procedure for removing the equipment. The person at the head holds the athlete's head in an in-line neutral position. The second person removes the mouthpiece. The jersey, shoulder pad strings and straps, and chin strap are cut. The jaw pads are removed by a gentle twisting motion which unsnaps them. The second person slides one hand up the cervical spine until as much of the hand as possible is on the occiput and places the other hand beneath the mandible. This person now controls cervical spine stabilization. The person at the head spreads the helmet at the ear holes and removes the helmet. A slight forward rotation of the helmet may be necessary in order to clear the occiput. Excess forward rotation may cause the face mask to become caught on the nose.

Two additional people slide their hands between the scapula and posterior shoulder pad plate from each side. At the command of the person holding the head, all three people lift the thorax and head as a unit. The person who was originally holding the helmet removes the shoulder pads. The athlete is now lowered to the ground as a unit, and cervical spine stabilization can be resumed by the person who removed the shoulder pads. It is important to emphasize that the athlete's head and thorax need to be lifted less than an inch in order for the pads to be removed. Practice is necessary in order to perform this procedure easily and quickly (Figs 2 & 3).

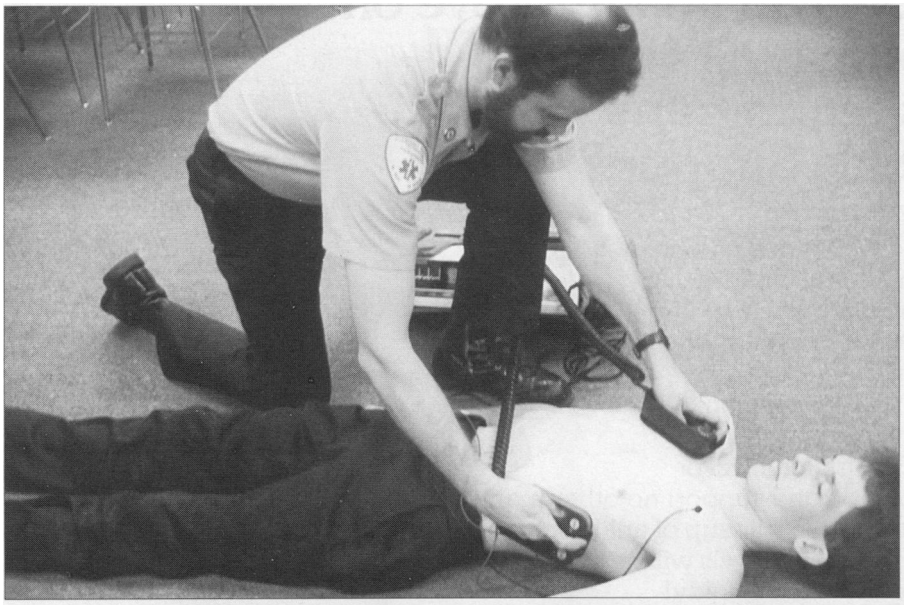

Fig 1.—Proper defibrillator paddle placement.

EMS Interaction

Efficient interaction between EMS and athletic trainers is essential if athletes with critical injuries are to be managed properly. While EMS personnel may be on hand for games, they most likely are not immediately available during practices. Athletic trainers must have a means of activating EMS immediately. The trainer must have the necessary equipment and training to initiate emergency treatment. A close, working relationship between the athletic trainer and EMS will ensure that the athlete is treated properly.

All athletic trainers must learn the capabilities of their local EMS agency. Not all EMS agencies are capable of delivering advanced life support measures, such as defibrillation, intravenous access, and intubation. Indeed, 911 service is not available everywhere in the United States.

Fig 2.—With the head stabilized, prepare to lift the torso maintaining cervical spine alignment.

Fig 3.—Lift the player as a unit and remove the shoulder pads.

A close, working relationship with EMS has been mentioned several times. The athletic trainer can conduct educational sessions for EMS on sports injuries. If the EMS agency is a volunteer organization, the athletic trainer may choose to join the agency and gain emergency medical technician or paramedic certification. Inviting the members of EMS to observe summer football camp will allow them to understand the nature of athletic training. The athletic trainer might consider observing emergency calls with the EMS agency to understand the nature of EMS. Any or all of these methods can be used to promote a strong and positive relationship. Athletic trainers should explore these methods and see which would be best for them. Other ways of promoting this relationship might be found.

If your local EMS agency does not provide advanced life support, you may want to consider obtaining an automatic external defibrillator. These devices have gained wide popularity recently, with the evidence of increased success of rapid defibrillation.[5] Lay persons have been trained to use these devices safely.[13] You must consider the cost of the device and state laws, but the value of early defibrillation cannot be minimized.

Planning

Fortunately, critical injuries do not occur commonly in football. Nevertheless, athletic trainers must be prepared for just such an event. This preparation includes:

1. An effective and practiced emergency plan with a good working relationship with the local EMS agency;
2. Good evaluation skills so that critical injuries may be recognized early;
3. Readily available equipment to manage the patient until EMS arrives;
4. Regular practice using the equipment by all members of the athletic training staff;
5. Legal certification to use any equipment that might be outside the scope of practice of athletic training;
6. Practice in removing all equipment (not the face mask alone) in the event of a critical injury. Practice in removing equipment is vital.

Proper preparation for the unlikely will increase the success of resuscitating a critically injured football player. I believe that we, as a profession, are fooling ourselves if we think that face-mask removal is our only concern. Other equipment must be removed sooner or later. Who is better qualified to do this than the athletic trainer? I urge athletic trainers to examine their own situations and ensure that they have an effective plan and the proper training and practice to deal with these unlikely, but all too inevitable, events.

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