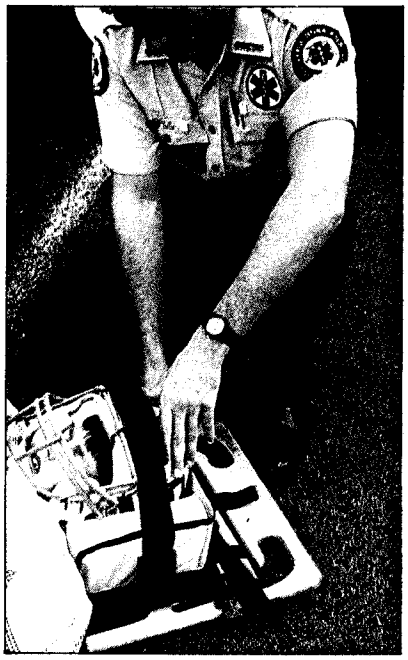

Photo courtesy Bob Bashaw

Immobilizing The Spine-Injured Football Player

by Francis Feld, M.Ed., EMT and Robert Blanc, MS

The on-scene management of a football player with a suspected cervical spine injury is not the same as that of a typical cervical spine injury caused by trauma or an accident. Special consideration must be taken due to the protective equipment that is worn.

A basic tenet of emergency medicine is to minimize the risks of additional injury to the patient. Removing the football helmet from a player can make a potentially serious injury worse.

While techniques for spine board immobilization are universal for cervical spine injuries no matter what the cause, the helmet and shoulder pads worn by the player make the football injury unique. This poses a special dilemma for EMS personnel.

The incidence of catastrophic head and neck injuries in football is relatively low. Mueller and Blyth have reported that from 1977-85 there were 67 direct fatalities in a population of 1.3 million scholastic players, 75,000 collegiate players and 200,000 youth league players.[1] In the same period, there were 93 cases of permanent cervical spine injuries with 74 in high school and 14 in college. Translated into incidence of injury per 100,000 participants there were 0.44 direct fatalities, 0.38 high school cord injuries and 2.67 college cord injuries in 1985.[2]

Equipment

Football helmets are made of polycarbonate shells approximately 4 mm thick. The inside of the helmet is composed of thick padding, air cells or a combination. Older, suspension-type helmets are still in use but the combination padded/air cell helmets are the most popular. Some of the air cells are actually bladders which are inflated by a hand pump. Common manufacturers are Riddell, Bike, and Rawlings.

Helmets also have face masks which are of varying configurations. Face masks are constructed of either plastic or plastic-coated steel. The masks are attached to the helmet by four rubber clips: two above the forehead and one by each cheek. Some older face masks are attached by two screws on each side. The chin strap is fastened by two snaps at each cheek. Without exception, face masks block the airway.

Shoulder pads are plastic shells with 1-3.5 cm thick padding on the inside. They are fastened by straps which are permanently attached in the rear and are clipped to the sternum plate. There may be one or

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The equipment worn by football players differentiates their injuries from other C-spine injuries, and implies specific prehospital treatment.

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Photos courtesy Francis Feld

It is important for rescuers who treat football injuries to become familiar with the equipment worn, as it is oftentimes the protective equipment that makes evaluation and treatment of many football injuries difficult.

two straps on each side. Many players also wear cervical neck rolls which are attached to the shoulder pads. These rolls are constructed of high density foam and can be from 5-8.5 cm in diameter. The purpose of the collar is to restrict lateral flexion and hyperextension in an attempt to minimize brachial plexus stretch injuries.

A common misconception is that junior high school and professional football players wear different types of equipment. This is incorrect. The only substantial differences found in equipment is size. The basic construction of all football equipment designed for contact is the same.

Helmet Removal

Without question, removal of the football helmet prior to spine board immobilization is extremely controversial. EMS textbooks acknowledge this controversy while illustrating the steps for helmet removal. Students are advised to consult local protocol.[3] Athletic training textbooks universally state the helmet should never be removed until definitive treatment and permanent immobilization can be instituted in the emergency department.

Four reasons were given for helmet removal in a recent EMT course taken by one of the authors. They are:

1. Unable to obtain proper immobilization.
2. Unable to visualize injuries.
3. Unable to control airway.
4. Hyperflexion of the head with the helmet in place.

Although these reasons are intended to apply to all types of helmets including football, motorcycle and auto racing,[4] it is the authors' contention that these reasons do not apply to the football helmet. The rationale follows.

Unable To Obtain Proper Immobilization

Football helmets must fit snugly in order to be effective. When a football player wearing a helmet is secured to a spine board with a cervical immobilization device (CID), the head will not move. Most CIDs will accommodate a helmeted football player. A sport CID is commercially available. Football players do not play with helmets which are grossly loose. Therefore, the head will not move within the helmet. In fact, it should be noted that football helmets are not designed to protect the neck and they do not cause neck injuries. The primary mechanism of injury in catastrophic neck injuries has always been considered to be hyperflexion although recent evidence suggests that axial loading of the cervical vertebrae may be a more common mechanism of injury.[5]

Unable to Visualize Injuries

Victims of traffic accidents are subjected to blunt force trauma and the incidence of facial soft tissue injury, depressed skull fracture and cranial lacerations is high. This is not the case in football. A head and neck injury in football will be just that. The incidence of significant facial soft tissue injury, depressed skull fracture or other types of trauma are negligible. The player's ears can easily be inspected through the earholes. The facemask does not hinder pupil examination. The cervical spine can be palpated with the helmet in place. In fact, palpation of the spine is of little clinical significance when weighed against the patient's chief complaint, motor and sensory evaluation of the arms, and hypertrophic cervical musculature.

Unable To Control The Airway

Any sharp knife can cut the clips holding the face mask in place. With removal of the face mask and chinstrap, access to the nose and mouth is obtained. Airways may be inserted and jaw thrust performed without difficulty. But this is extraneous. Airway problems in these injuries are even rarer than the injuries themselves. The vast majority of football cervical spine injuries involve the lower cervical vertebrae (C5-C7).[6] "The phrenic nerve originates chiefly from the fourth cervical nerve but is augmented by fibers from the third and fifth nerves."[7] Respiratory distress can occur if the cord is disrupted at or above the level because the phrenic nerve innervates the diaphragm. Respiratory arrest caused by spinal cord injury leaves the victim with a very poor prognosis. Resuscitative efforts may be futile.

Hyperflexion Of The Head With Helmet In Place

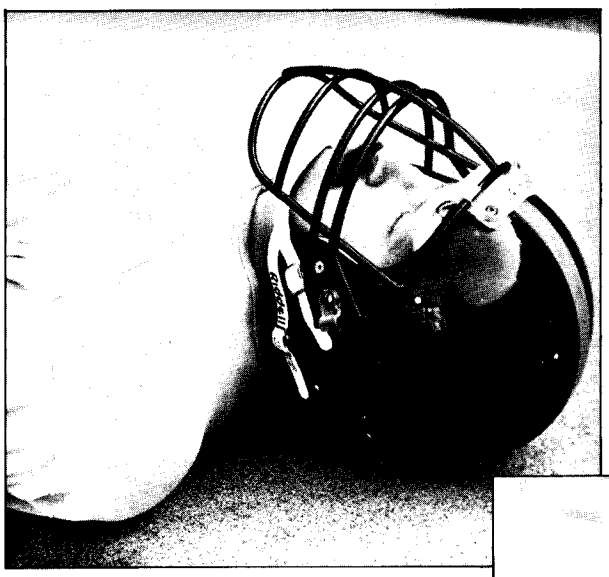
A helmet will cause hyperflexion of the cervical spine in a motorcyclist. This is not the case in a football player. The shoulder pads worn in football will elevate the thorax such that the cervical spine will remain in a neutral position in relation to the head and body.

Evaluating and treating injuries of a football player can be difficult due to the nature of his protective equipment. This is especially true when dealing with possi-

ble cervical spine injuries. It is important to become familiar with the equipment worn and how it should be handled.

Football helmet removal is best performed in the emergency department after a complete neurological evaluation. A patient with a non-displaced spine fracture may recover without neurological deficit if handled properly. The spinal cord need not be transected in order to cause permanent paralysis. By removing the helmet in the field, there is a greater chance of needless motion to the spine than if the helmet were removed in the controlled environment of the emergency department.

We believe that it is better for EMTs to leave the football helmet in place while immobilizing and transporting a player with a suspected cervical spine injury. Removal of the football helmet must also include removing the shoulder pads, a skill which should be taught to emergency department physicians. □



A comparison of the two photos here shows the effect of helmet removal. With the helmet on, the cervical spine is in a neutral position. Removal of the helmet causes the C-spine to become hyperextended.

Footnotes

1. Mueller, Frederick O., Blyth, Carl S.: An Update on Football Deaths and Catastrophic Injuries. *The Physician and Sportsmedicine.* 14(10):139-42. 1986.

2. ibid.

3. Hafen, Brent Q., Karren, Keith J. *Prehospital Emergency Care & Crisis Intervention.* Englewood, CO. Morton. 1983. p.276-77.

4. Pennsylvania Emergency Medical Technician Certification, Community College of Allegheny County, Pittsburgh, PA. Fall, 1986. Instructors: William Plunkett and Rick Fuller.

5. Torg, Joseph S. *Athletic Injuries of the Head, Neck, and Face.* Philadelphia, PA. Lea and Febiger. 1982. p.145.

6. ibid. p. 195.

7. Gray, Henry, *Anatomy of the Human Body.* Philadelphia, PA. Lea & Febiger. 1974. p.959.