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A Discussion of the Issue of Football Helmet Removal in Suspected Cervical Spine Injuries

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Abstract: *In some areas, it is a commonly accepted emergency medical technician protocol to remove a helmet during the initial management of suspected cervical spine injures. After a comprehensive survey of relevant literature, four primary reasons why Emergency Medical Services professionals would desire to remove a helmet emerge. Sources suggest that the presence of a helmet might: 1) interfere with immobilization of the athlete; 2) interfere with the ability to visualize injuries; 3) cause hyperflexion of the cervical spine; and 4) prevent proper airway management during a cardiorespiratory emergency. Many available protocols are designed for the removal of closed chamber motorcycle helmets that do not have removable face masks. There are a great number of differing viewpoints regarding this issue. The varying viewpoints are results of the failure of many emergency medical technician management protocols to address the unique situation presented by a football helmet. We: 1) demonstrate that football helmet removal is potentially dangerous and unnecessary, 2) suggest that cardiorespiratory emergencies can be effectively managed without removing the helmet, and 3) provide sports medicine professional with information that may be used to establish a joint Emergency Medical Services/Sports Medicine emergency action plan.*

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The issue of football helmet removal after possible cervical spine injury is a source of great controversy within many athletic training circles.[4–12] Much of the debate stems from the discrepancies between emergency medical technician (EMT) protocols and sports medicine protocols. In some regions of the country, it is a commonly accepted EMT protocol to remove a football helmet during the initial management of suspected cervical spine injuries.[5–8,12] Despite the established EMT protocols, sports medicine professionals almost universally discourage removing the football helmet when there is even the slightest question of a cervical spine injury.[1,2,5,6,8,10,12,14,15] The rationale for leaving the helmet in place is to prevent further injury.

Because there is considerable debate on this issue, we felt that taking an objective look at the arguments both supporting and refuting football helmet removal was warranted. After careful consideration of the available literature and evidence, it became clear that football helmet removal in athletes with a potential cervical spine injury is undesirable.

The purpose of this article is to: 1) demonstrate that football helmet removal is potentially dangerous and unnecessary; 2) suggest that cardiorespiratory emergencies can be effectively managed without removing the helmet; and 3) provide sports medicine professionals with information that may be used to establish a joint Emergency Medical Services/Sports Medicine emergency action plan.

Review of the Related Literature

Several notable articles touching upon the issue of football helmet removal have been written. Feld and Blanc[6] presented the rationale for current EMS protocols mandating helmet removal and demonstrated that the design of the football helmet and the manner in which it is used renders these protocols inapplicable. The authors concluded that a helmet should not interfere with the management of cardiorespiratory emergencies, visualization of injuries, and immobilization of an athlete on a spine board. In addition, it was suggested that further injury might

result from premature helmet removal.[6]

Similarly, Vegso and Lehman[14] presented a detailed description of the on-field evaluation and management of all head and neck injuries. A large portion of their article was dedicated to the management and immobilization of the football player with a cervical spine injury. They included many photographs to illustrate immobilization on a long spine board. The authors clearly stated that when managing a cervical spine injury, prevention of further injury is the foremost priority. They maintained that the football helmet should remain in place and only the face mask should be removed.[14]

Finally, Denegar and Saliba's[5] work dealt specifically with the management of potential cervical spine injuries in football players. The authors presented the arguments of both EMS officials and sports medicine professionals regarding helmet removal. The discrepancies between both protocols were clearly defined and a universal management protocol was suggested. They presented two situations that warrant helmet removal: first, when the face mask or visor interferes with adequate ventilation or the EMT's ability to restore an airway; and, second, when the helmet is so loose that adequate spinal immobilization cannot be obtained with the helmet in place.[5] The article emphasized a need for communication between athletic training staffs and local EMS units prior to athletic seasons.[5]

Why Current EMS Protocols Do Not Apply to Football Helmets

Feld and Blanc's article[6] presented four reasons why EMS protocols call for helmet removal and provided subsequent objections to each. EMS officials suggest that the presence of a football helmet might:

1. interfere with immobilization of the athlete;
2. interfere with the ability to visualize injuries;
3. cause hyperflexion of the cervical spine; and
4. prevent proper airway management during cardiorespiratory emergencies.[6]

Response to 1

A football helmet, when fitted properly, is secured to the head very snugly by its interior padding or air bladders, cheek pads, and chin straps. Very little motion of the head is possible. When the athlete is secured to a cervical immobilizing device, the head and helmet are immobilized as a unit. This allows minimal motion of the entire cervical spine.[6]

Response to 2

Feld and Blanc[6] brought up a very good point in their rebuttal to this particular point. They stated that, "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."[6] The signs and symptoms of injuries sustained in football can be visualized through the face mask and ear holes (ie, pupil size and reaction to light, otorrhea, rhinorrhea, etc). For the purposes of emergency management, adequate visualization is provided by virtue of the football helmet's fundamental design.

Response to 3

In the case of a motorcyclist with a cervical spine injury, the thickness of the helmet shell may cause hyperflexion, but in football, this is not an issue.[6] The thickness of the posterior portion of the shoulder pads offsets that of the helmet. The presence of both pieces of equipment creates a neutral alignment of the cervical spine. When the football helmet is removed, its shell is no longer present to offset the thickness of the shoulder pads. The end result is cervical hyperextension.[6] To illustrate this change in cervical alignment, plain film radiographs were taken laterally of the cervical spine with and without the helmet in place (Fig 1, a and b). Removal of the helmet hyperextends the cervical spine approximately 20° from C1 to C7. Despite the vari-

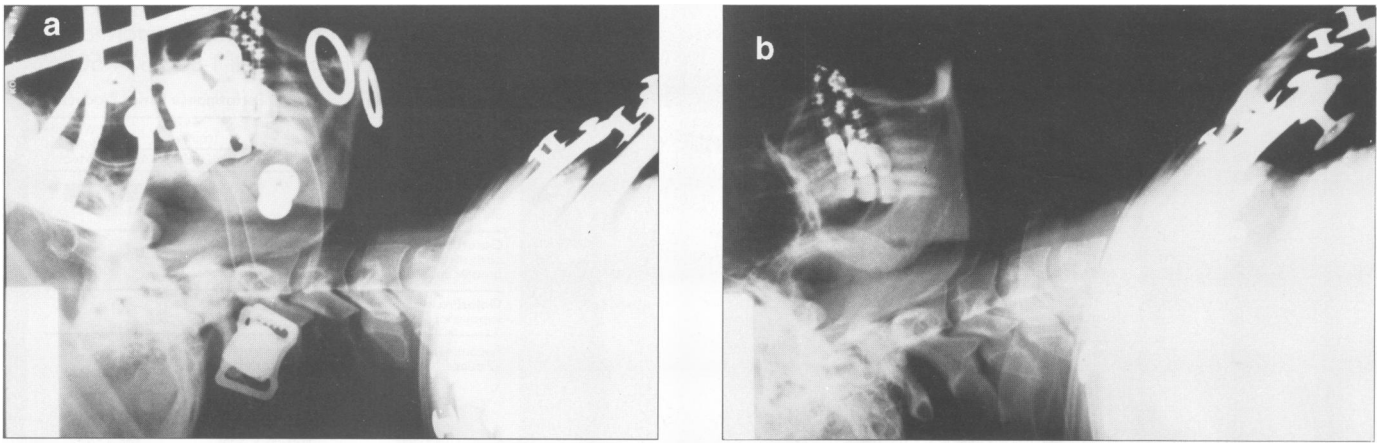


Fig. 1.—a, Lateral radiograph of the cervical spine with a football helmet and shoulder pads present. Note the neutral alignment of the cervical vertebrae. b, Lateral radiograph of the cervical spine after the football helmet has been removed. Note the increase in hyperextension (approximately 20°).

ances that occur between different body types and different equipment brands and sizes, cervical hyperextension will result from the removal of the helmet.[6]

Response to 4

In the management of cardiorespiratory emergencies, the ABC's are monumentally important and their maintenance constitutes the main thrust of our efforts. The fundamental differences between the EMS protocols and the sports medicine protocols is evident in the discussion of airway management. Current EMS protocols fail to address the unique situation presented by a football helmet. Most of these protocols are designed for the removal of the closed-chamber, full-coverage motorcycle helmet that does not have a removable face shield.[5–7] With the motorcycle helmet, it is easy to see why an emergency care provider would desire to remove the helmet. The football helmet is designed to allow for resuscitative efforts. With practice, the face mask can be removed quickly to allow access to the airway.

Management of Cardiorespiratory Emergencies in Football

In the unfortunate situation where a football player with a potential cervical spine injury goes into cardiac arrest, the need for quick decisive action by the attending medical staff cannot be overstated. The following chain of events is designed to address a potential cervical spine injury in a football player:

1. Check for unresponsiveness (Fig 2).
2. Note time of unconsciousness, stabilize the head and neck, and look, listen, and feel for breathing (Fig 3). All three events should take place simultaneously.
3. Using a suitable device, cut the plastic clips that secure the face mask. The Trainer's Angel is being used here (Fig 4a). While one person is cutting the clips, another should be cutting the jersey and the front string of the shoulder pads to allow access to the chest if compressions are indicated. A third person should be readying the one-way cardiopulmonary resuscitation mask (CPR) to give respirations (Fig 4b). Figure 4c shows a close-up of the equipment necessary to remove the mask, cut the jersey, and provide respirations.
4. Place the CPR mask over the nose and mouth and use a jaw thrust to open the airway. Give two ventilations and check the pulse (Fig 5).
5. Activate EMS.
6. Perform CPR until EMS arrives (Fig 6).

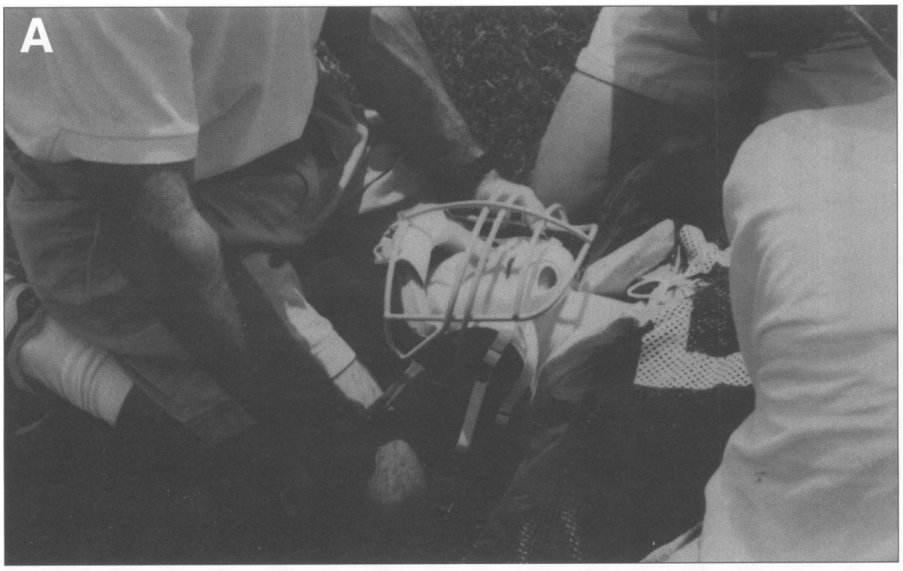
We have practiced the above-mentioned guidelines on CPR mannequins equipped with a football helmet and shoulder pads. We were able to provide sufficient respirations and adequate chest compressions during CPR. With careful organized practice, the face mask can be removed in less than 20 seconds, and the first breath can be given about 30 to 35 seconds after unresponsiveness has been determined.

Fig 2.—Checking for unresponsiveness.

Preseason Planning and Accessing EMS Officials

As with any sport, preseason is a time when athletes are supposed to be striving toward peak performance levels. As sports medicine professionals, we need to be at our peak levels before then so that we are ready to help our athletes. Sports medicine preseason is the time for planning, administration and review, and honing of skills.

Fig 3.—The person at the head is stabilizing the cervical region. Another person is assessing the breathing by listening for air exchange and by watching and feeling for the chest to rise. A third person is simultaneously noting the time of unconsciousness.



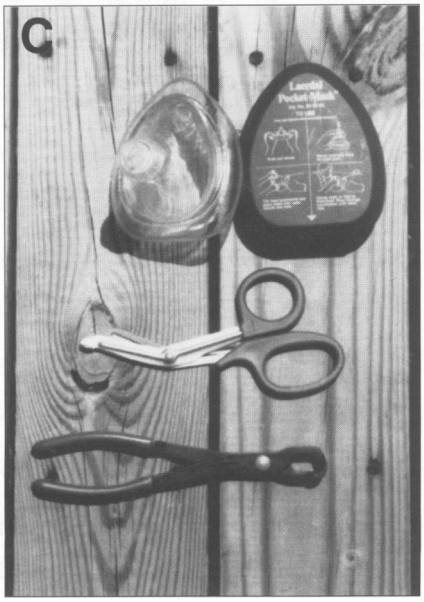


Fig 4.—A, The Trainer's Angel is being used by the person at the head to cut through the face mask clips. B, While the jersey and shoulder pad strings are being cut, a one-way CPR mask is being prepared so that respirations can be given. C, A close-up of the tools used. Top, Laerdal Pocket Mask; middle, EMT trauma scissors; bottom, Trainer's Angel.

This is the most appropriate time to plan for emergencies. It has been stated in previous articles that there is a need for communication between athletic training staffs and local EMS units.[5] When planning for emergencies, policies should be constructed so that they are concise and direct, but flexible enough to deal with unique situations. As current EMS protocols illustrate, an inflexible policy has the potential to create a great number of problems. In a conversation with Otho Davis, ATC (December, 1992), it was suggested that an annually reviewed interdisciplinary policy be instituted for each locality. However, it is not easy to establish a joint emergency action plan. Each state has its own governing agency that decides major policies. Some states are divided into regions that are autonomous. The policies set forth in these regions are subject to great variance.[5,7] However, the governing agency of each state should be able to describe the hierarchy of that particular state and provide the names of the people in charge at the county or regional level.

By contacting these people, an inquiring sports medicine professional should eventually be able to determine the following information: who is in charge of EMS within their own locality and who is in charge of establishing the protocols that govern EMS within that locality. This is admittedly a difficult task, but it is very important if a joint emergency action plan is to be established. Table 1 contains a current list of the governing EMS agencies in each state, along with phone and fax numbers. It is our hope that this will provide a means for establishing good communication.

Recommendations

During the completion of this article, various situations presented themselves, which added additional dimensions to the issue of football helmet removal and emergency care in general. The following recommendations are based on the literature we have reviewed, communications with many allied health care professionals, and

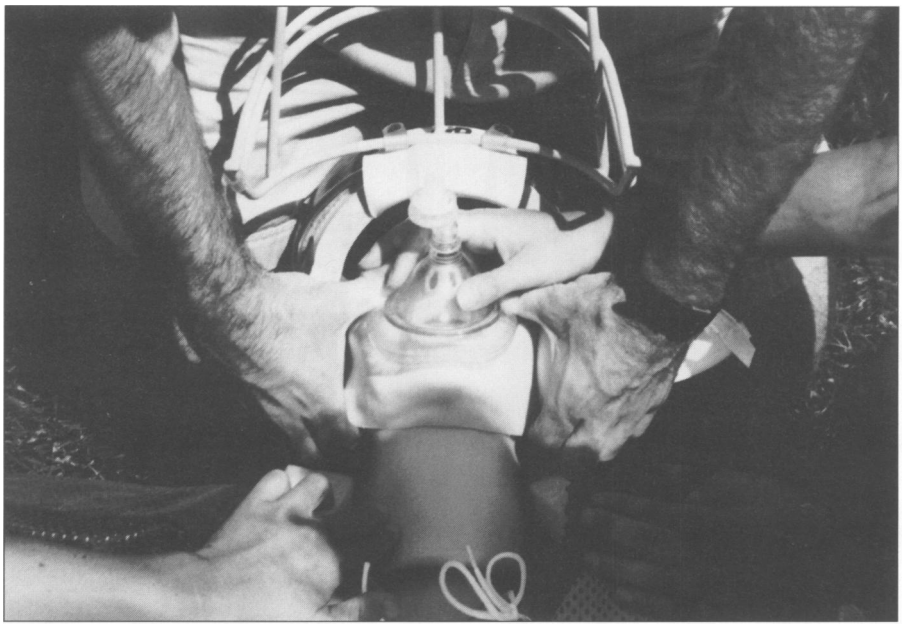


Fig 5.—With the mask in position, a jaw thrust is used to open the airway. Two breaths are given and the pulse is then assessed.

Fig 6.—After the access to the airway and chest has been established, CPR is then begun.

personal experience through practice.

1. All sports medicine staffs should open a line of communication with their local EMS systems and officials.
2. Currently, there is no direct communication between the National Athletic Trainers' Association and the National Association of State Emergency Medical Service Directors. With all of the discrepancies among protocols across the nation, it would seem that the formation of a joint EMS/Sports Medicine committee is in order. Such a committee would be well suited to establishing a universal protocol that deals specifically with the emergency management of potential cervical spine injuries in football players.
3. The management of a potential cervical spine injury in a football player needs to be practiced regularly by those responsible for providing emergency medical care (ie, sports medicine team, EMS personnel, hospital emergency room personnel). This should include performing CPR on a mannequin dressed in football equipment. Also, at some point in the emergency care, the helmet will need to be removed. All personnel should be trained to remove the helmet and shoulder pads in the safest manner possible with the least amount of cervical motion.
4. With the recent advancement in football helmet accessories, the question arises as to whether there is a need to adapt current or proposed management protocols. For example, Ridell manufactures the Cra-lite face mask, which is anchored to the helmet by clips composed of a dense polycarbonate material that require a special tool to cut them. Also, some athletes are now using the Pro-cap, which is an external helmet padding that is fastened to the shell. Additional padding increases the net thickness of the helmet and may alter cervical alignment. Finally shock-absorbing face mask clips are currently available in the United States. These may be constructed of a different material than the standard plastic clips. If so, they may slow face mask removal. Even though these accessories may not be standard equipment, their presence demands that emergency management protocols account for them.
5. The most efficient techniques to remove a face mask demand more attention. More research is needed to determine the devices that are most effective for face mask removal.

Conclusions

Although uncommon, catastrophic cervical spine injuries are an unfortunate reality in the realm of athletics.[3,13] Despite our best efforts to pre-

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vent their occurrence, there is always the element of risk. We urge all who are responsible for the well-being of athletes to communicate with their local EMS units and practice these skills. One mismanaged cervical spine injury is far too many. In a recent editorial, Knight summed it up well by saying, "Every athletic trainer... has a moral obligation to know that he or she can remove the face mask quickly enough to apply CPR.... Practice taking off football helmet face masks.... Do it because it is the right thing to do."[9]

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