

Management of the Critically Injured Athlete: Packaging of Head and Cervical Spine Injuries

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Annotation: Initially all sports medicine providers will encounter potential or real injury in collision and/or individual sports. Proper training and equipment must be available, and all involved must be ready to package and transport effectively when that injury occurs. Head and neck injuries can be catastrophic. This article points to the absolute necessity for a ready and organized response sports medicine team, good equipment, educated and practiced athletic trainer (ATC) and physician (MD) personnel, and emergency medical resources available.

Injuries to the spinal column are relatively rare in athletics. However, when they do occur, they must be treated promptly and correctly. Athletic trainers must know which procedures to use in these situations. They must have the necessary equipment readily available and be proficient in its use. The regular practice of immobilization of athletes with potential cervical spine injuries is a must for athletic trainers who expect to perform these important tasks in an actual emergency.

Care of the injured athlete should follow a carefully designed protocol.¹ The athlete's airway, breathing and circulation, neurologic status and level of consciousness should all be assessed, and the emergency medical services system should be activated.

Since unconscious individuals are unable to speak, they are unable to tell the rescuer if they have a spine injury. Therefore, all unconscious athletes with a mechanism that may have included a collision or a fall, and conscious athletes with any sign or symptoms suggesting cervical spine trauma, must be treated as if they have a cervical spine injury.

Any athlete suspected of having a head or spinal injury should not be moved and should be managed as though a spinal injury exists. The athlete should not be moved unless it is absolutely essential to maintain airway, breathing, and circulation. If the athlete must be moved to maintain airway,

breathing, and circulation, the athlete should be placed in a supine position while maintaining spinal immobilization.

In the conscious athlete, a possible cervical spine injury must be identified early. Athletes who cannot execute gentle movement of the head should be suspected of having significant cervical spine trauma and should be treated accordingly.² Cervical spine injuries are usually orthopaedic in nature and may or may not have immediately observable neurologic sequelae.

Athletes with no neurologic signs or symptoms and no findings suggesting trauma to the cervical spine can be safely moved to a more suitable site for further evaluation. But remember, if there is any question as to medical status, it's best to err on the side of safety and treat the injury as if it were a significant cervical spine injury.

When it becomes necessary to transport the athlete, the head and trunk should be moved as a unit. One accepted technique is to manually splint the head to the trunk. It takes at least four people to move an injured athlete correctly. One rescuer must stabilize the athlete's head and cervical spine. As a general rule this should be the most qualified and experienced person on the scene. It is imperative that this rescuer maintain cervical alignment throughout the procedure, until the athlete is completely immobilized on a suitable device.

Following a Plan

Injuries to the head and neck are difficult to evaluate and treat in the athletic environment. To adequately prepare for these and other critical injuries to athletes, athletic trainers must develop an emergency action plan. They must make sure to have proper equipment readily available and in good working order.¹

The sports medicine team must be prepared for any emergency. Preparation includes education and training, maintenance of appropriate emergency equipment and supplies, utilization of appropriate personnel (including certified athletic trainers [CTAs]), and the formation and implementation of an emergency plan.

Emergency plans should be comprehensive and practical, yet be flexible enough to adapt to any emergency situation. The emergency plan must be established, approved, revised, and rehearsed on a regular basis.³ Each emergency plan may

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vary, but should include information on education, emergency equipment, personnel, communication, and a rehearsal schedule.

The emergency plan should also address equipment issues, which are particularly important in managing and packaging suspected head or cervical spine injuries. Each member of the emergency team should be knowledgeable and practiced in the function and operation of emergency equipment. It would be helpful for each member of the sports medicine team to be multi-skilled and cross-trained in the use of all emergency equipment. For example, it is common for CTAs to know how to remove a football helmet face mask, while physicians and emergency medical technicians (EMTs) may not. Likewise, EMTs are more practiced in packaging an individual for transportation than are athletic trainers.⁴ It has been suggested that practice with the tools required for face mask removal of the catastrophically injured football player is essential.

While it is not the purpose of this article to discuss the emergency plan, it is important to emphasize that following an organized plan is critical to the emergency management of an athlete with a suspected head or cervical spine injury. Furthermore, the emergency plan should address equipment issues specific to the management and packaging of suspected head or cervical spine injuries.

The Athlete's Equipment

When to remove the face mask

Any athlete wearing protective shoulder pads and helmet, who has suspected cervical spine injury, should be treated with their equipment left in place to minimize risk of further trauma secondary to cervical spine motion. The face mask should be removed as quickly as possible any time a football player is suspected of having a head or neck injury, even if the football player is still conscious. The face mask should be removed before transportation, regardless of current respiratory status. The face mask will need to be removed anyway for evaluation of vital signs, transportation, and/or intubation in the event that the football player stops breathing. It is suggested the emergency medical provider not wait until the football player stops breathing to begin the task of face mask removal.

How to remove the face mask

The face mask of the football helmet is secured to the helmet with four plastic loop straps which can be cut, or removed, thus allowing the face mask to be retracted or removed. When the two lateral loop traps are cut or removed, the face mask can be retracted or "swung-away" using the two anterior loop straps as a hinge. This procedure enables medical personnel to gain access to the airway and vital areas of the face for examination, and to administer prehospital

care to the football player without having to remove the helmet. This procedure of face mask retraction is currently accepted as the preferred protocol in sports medicine. However, recent data has reported that more head and neck movement occurs while the face mask is being retracted, and not while the straps are being cut.⁵ Therefore, these preliminary data suggest that all four straps should be cut and the face mask should be removed, rather than being retracted. Reducing movement of the football player's head and neck is of primary importance since it is believed that any additional movement that occurs during face mask retraction can cause secondary damage to the football player with an injury to the cervical spine.

A recommendation is to use a sharp knife, scalpel, or box cutter to cut the loop straps. However, today's loop straps are made of harder plastics and are more difficult to cut.⁶ There have also been reports during research studies of subjects (rescuers) injuring themselves when the knife slips while trying to cut through the loop straps.⁶

DuraShears, or EMT scissors, are a popular tool in the field for cutting seat belts, clothing, etc., but are not recommended for cutting loop straps. One research study evaluated these scissors with both CTAs and EMTs as subjects. The times that it took to remove the face mask with the DuraShears were judged unacceptable, with most being greater than 8 minutes, and one EMT taking as long as 35 minutes.⁶

Currently, the most popular and widely used tool for face mask retraction is the Trainer's Angel,⁶ and is the only tool currently available specifically designed to cut the loop straps that secure the face mask to the helmet. However, when compared during scientific investigations, the Trainer's Angel was found to produce greater amounts of head movement than the other tools studied.

The task of face mask removal should be accomplished as quickly as possible, and with as little movement of the head and neck as possible. So the best tool used for face mask removal should be efficient with regards to both time and movement.⁶ Those involved in the prehospital care of injured football players should have tools for face mask removal readily available.

When to remove the helmet

Only the face mask should be removed from the helmet. The helmet itself should not be removed unless the rescuer is unable to access the airway by all other means. Furthermore, by removing only the face mask and not the entire helmet, the spine will remain in a neutral position. If the helmet were removed, the athlete's head would hyperextend, particularly when the athlete is wearing shoulder pads. Unless the shoulder pads were removed first, it would be very difficult to maintain in-line neutral stabilization.

In the management of an injured football player with a suspected spinal injury, both the National Athletic Trainers

Association,⁷ and the American College of Sports Medicine⁸ have promoted statements that advise against the removal of football helmets. Reducing the head and neck movement that occurs during helmet removal is very important since unnecessary movement may cause further damage to the football player with a cervical spinal injury.⁵ The athletic helmet and chin strap should only be removed if: 1) the helmet and chin strap do not hold the head securely, such that immobilization of the helmet does not also immobilize the head; 2) the design of the helmet and chin strap is such that even after removal of the face mask the airway cannot be controlled, or ventilation be provided; 3) the face mask cannot be removed after a reasonable period of time; 4) the helmet prevents immobilization for transportation in an appropriate position.

Transfer of the Athlete

Log roll of a supine athlete

The person at the head (rescuer 1) must maintain the head-spine in a neutral position. A rigid cervical collar should be applied. Neutral positioning is maintained by the rescuer at the head until it is completely splinted on the full body splint. The athlete's arms should be maintained at his or her side (palm inward). Rescuers 2 and 3 should roll the athlete onto the arm during the log roll maneuver. The athlete's arm should be kept to the side during the roll unless it is injured. In which case the arm should be raised over his or her head. However, this may be difficult in the presence of shoulder pads. Shoulder pads are not easy to remove, especially if worn with a neck collar; thus they should only be removed in the most extenuating of circumstances.

The body splint should be placed at the athlete's side, and the two additional rescuers should kneel at the athlete's side away from the splint. Rescuers 2 and 3 should be positioned with rescuer 2 at the chest and rescuer 3 at the thigh area. Rescuer 3 is expected to control both legs during the log roll maneuver.

Rescuer 1 is in charge, and gives each and every command to move the athlete. Rescuer 1 must continue to maintain neutral positioning of the head and neck complex until the athlete is completely immobilized.

To roll, rescuer 1 gives the command "Prepare to roll, roll." The assistants roll the athlete onto his or her side, toward the rescuers. By rolling onto the athlete's arm, the head, shoulders, and pelvis are kept in anatomic alignment.

When the athlete is rolled onto his or her side, rescuer 2 should be in position to assess the back for any visible signs of injury. At this point, the splint should be placed into position and held against the athlete's back and held at a 30-degree angle. While the positions are maintained, rescuer 1 gives commands "Prepare to lower, lower," and the athlete is lowered onto the splint.

The Log Roll of a Prone Athlete

Due to the urgency of oxygen for the athlete, assessment must be made very quickly and efficiently. If the athlete is not breathing, a log roll should be performed immediately.⁹ Unless the immobilization device is immediately available, the athlete must be immediately log rolled into a supine position, and then log rolled a second time on to the body splint. Obviously, with each unnecessary movement the chances of a secondary injury increase. Athletes who are vomiting or bleeding from the oral cavity must be kept prone, or placed on their side to prevent aspiration of food or vomitus into the airway.

To immobilize the prone athlete, rescuer 1 immobilizes the neck in a neutral position. The hands are placed on the athlete's head with the thumbs pointing to the athlete's face. All athletes should be treated with a rigid cervical collar, unless their equipment prevents such, as would be the case with hockey and football. Next, position the immobilization device next to the injured athlete. Survey the athlete for any additional injuries. Place the splinting apparatus on the side of rescuer 1's lower hand. If the arm next to the splint device is injured, carefully raise the arm above the athlete's head so he/she does not roll onto the injured arm. Again, this may be difficult if the athlete is wearing protective equipment.

Rescuer 2 and 3 should position themselves adjacent to the athlete, opposite the splinting device. Rescuer 2 is located at the chest area and 3 at the level of the thighs. To roll, rescuer 1 gives the command "Prepare to roll, roll". The assistants roll the athlete onto his or her side, toward the rescuers. By rolling onto the athlete's arm, the head, shoulders, and pelvis are kept in anatomic alignment. The splinting device should be positioned at a 30-degree angle. While po-



Patient stabilized with helmet and shoulder pads in place.

sitions are maintained, rescuer 1 gives the command “Prepare to lower, lower” and the athlete is lowered onto the splint.

Immobilization Equipment

Any injured athlete who may have a cervical spine injury should be immobilized on a suitable full-body splint. The equipment used for splinting athletes with head and/or neck injuries will depend on the appliances available as well as the training and know-how of emergency medical personnel.

Athletic trainers must know how to use the equipment that is available to them. It is shocking to read reports about sports healthcare professionals not being able to use, in a proper manner, the devices they have purchased for emergency care. Considering that firefighters regularly drill to rehearse the handling of equipment they use frequently, athletic trainers should practice repeatedly with equipment that will be used infrequently. The following discussion focuses on two popular techniques for spinal immobilization: the Miller full-body splint and the standard rigid spine board.

Miller full-body splint

To use the Miller full-body splint, move the splint next to the athlete. Open the harness and fold all straps onto themselves to prevent entanglement of the Velcro. Log roll the athlete onto the Miller full-body splint. Place the chest straps loosely over the athlete’s chest. Place the shoulder strap onto the chest strap. Thread the chest strap through the pins on the Miller full-body splint. Adjust the chest trap, then adjust the shoulder straps. Do not over-tighten either of the straps. Adjust the torso, the leg and ankle straps to secure the athlete to the Miller full-body splint. If athlete is wearing a protective helmet, tape the helmet directly to the Miller full-body splint head piece. Apply the chin strap snugly but allowing the mouth to open.

Rigid spine board

The person at the head should maintain stabilization of the head and neck, including gentle pressure to the head and neck to maintain neutral positioning. Involve a minimum of three assistants for execution of this splinting technique. The person at the head coordinates any movements of the team. For the log roll, the assistants coordinate a pulling action to log roll the athlete toward their legs. Upon the person at the head’s command, lower or roll the athlete onto the rigid spine board. Pad the back of the thorax if shoulder pads are removed. This maintains anatomic alignment of the spine with the helmet left in place.

Apply blankets, rolled towels, or commercial head immobilizers and strap into position. Secure the helmet to the backboard with adhesive tape. Two straps are positioned

through the board at the level of the armpits. Pull the upper end of the straps over the shoulders and across the chest. Lace the straps through the lateral holes at the level of the pelvis. Bring the straps across the lower pelvis and upper legs. Lace through the lateral holes and connect below the knees. Apply the straps snugly so the athlete does not move if moved on his side due to vomiting. Generally, with a helmet and shoulder pad in place, no cervical collar is used, only towels to fill voids. In the event the sports participant was not wearing protective equipment, including helmets and/or shoulder padding, a cervical collar would be applied to assist in immobilization of the cervical spine.

At any point the athlete requires repositioning, lift the athlete vertically. If the athlete is not wearing a helmet, a rigid cervical collar should be utilized to maximize protection of the cervical spine. Leave the chin free to access the athlete’s airway. Pad the areas behind the low back and knees to fill all voids between the body and board. Tie the hands and legs together in the event of an unconscious athlete. Once completely stabilized, the person at the head relinquishes his control. Move the athlete on the board to a stretcher and transport to advanced medical facilities.

Summary

Emergency medical personnel must take extreme caution when evaluating and treating an athlete with a suspected head or spine injury. While head and neck injuries may continue to be life threatening, the proper management of these injuries may prevent further injury from occurring.

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