
CLINICAL SUGGESTION, “ON THE SIDELINES” CHEST INJURIES, WHAT THE SPORTS PHYSICAL THERAPIST SHOULD KNOW

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ABSTRACT

Chest injuries in contact and collision sports are relatively rare, particularly those that are life threatening. However, as with every sports related injury, one must initially consider life threatening situations that may occur as a result of collision with another player, a stationary object, or being struck with some type of object (missile). In other words, as is the case in all acute sports injury assessment, the mechanism of injury must be considered when evaluating the injured athlete on the field as well as on the sidelines. The Sports Physical Therapist (PT) must look for several initial life threatening conditions as well as be aware of and monitor for the development of these symptoms during the subsequent evaluation of the athlete. The purpose of this clinical commentary is to review the presentation and management of several emergent conditions associated with injuries to the chest and thorax.

Key Words: Chest injury, commotio cordis, flail chest, pneumothorax

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INTRODUCTION

Chest injuries in contact and collision sports are relatively rare, particularly those that are life threatening.¹ However, as with each sports related injury, one must initially consider life threatening situations that may occur as a result of collision with another player, a stationary object, or being struck with some type of object (missile). In other words, as is the case in all acute sports injury assessment, the mechanism of injury must be considered when evaluating the injured athlete on the field as well as on the sidelines. The Sports Physical Therapist (PT) must look for these initial life threatening conditions as well as be aware of and monitor for the development of these symptoms during the subsequent evaluation of the athlete. These injuries may occur with both blunt trauma to the chest/thorax (more common) as well as with penetrating injuries (extremely rare occurrences in sporting events).^{1,2}

Typical signs and symptoms of chest injuries in athletics include dyspnea, signs of shock, a feeling of “impending doom” on the part of the athlete, hemoptysis, decreased breath sounds, irregular pulse, tracheal deviation and distended neck veins.^{1,2,3,4} Any of these symptoms may constitute a medical emergency and it is the responsibility of the Sports PT is to recognize the medical emergency, relay information to the emergency operator, and provide care for the athlete until more advanced medical personnel arrive.

Potential life threatening injuries and conditions that may be encountered include flail chest, open chest wounds, pneumothorax, tension pneumothorax, hemothorax, myocardial contusion, cardiac tamponade and diaphragmatic rupture. Each of these conditions is a possible occurrence in injuries sustained while participating in collision/contact sports. The Sports PT must be able to recognize the signs and symptoms of potentially life threatening injuries and proceed with safe and effective management of any of these when encountered.

Flail Chest

The condition known as flail chest occurs when one or more ribs are fractured in one or more places.² Rib fractures are determined by palpation for bony abnormalities, localized tenderness, the feeling of “crepitus” or a grating feeling when the fracture sites

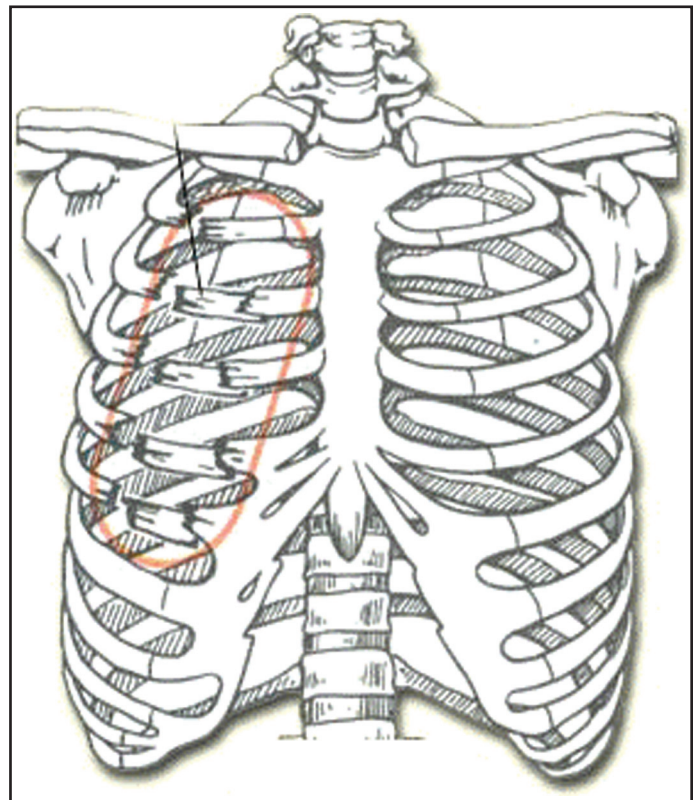


Figure 1. Graphic representation of multiple rib fractures, circled in red.

move against one another. An additional method of determining the presence of a rib fracture is with the use of a tuning fork placed against each of the individual ribs of the athlete. A positive tuning fork test (indicating the possible presence of a fracture) is the sudden onset of acute pain in the rib(s) and the athlete suddenly moves away from the tuning fork complaining of the onset of sharp pain. (Figure 1)

Should the presence of multiple rib fractures be noted, the result may be the presence of what is known as **paradoxical breathing**.^{1,2} On inhalation, the “flail” segment moves in an inward direction rather than expanding as in normal inspiration. As the player exhales, the “flail” segment will expand or rise rather than fall in a posterior direction if the athlete is supine. This could constitute a true medical emergency and the local emergency service should be contacted with information that the player may have a flail chest. If rib fractures are suspected, the athlete must be made comfortable, be monitored for signs and symptoms of shock, and have his/her respiratory effort monitored for rate and quality.^{1,2} The athlete should be transported to the local medical facility.

Open Chest Wounds

Open chest wounds rarely occur in sports. This injury is a result of an object (missile) penetrating the chest wall of the player. The result can be life threatening due to the collapse of the lung or penetration of other organs at the site of the injury. If penetration of the lung occurs, the therapist may hear a “sucking” sound which is termed a “sucking chest wound”.² That is, the sound of air being drawn into the chest through the opening in the chest wall, as opposed to through the mouth and nose. Proper action is to seal the wound with an air tight dressing, such as a piece of plastic, secured with tape on three sides. The fourth side must be left open to allow air to escape from the chest during exhalation. The EMS system should be promptly utilized to transport the athlete to the local medical facility.

Pneumothorax/Tension Pneumothorax

Tension pneumothorax occurs when the integrity of the lung tissue is compromised, allowing air to escape from the lung into the surrounding pleural tissue. This occurs when the lung tissue ruptures within the chest cavity, either with or without trauma. This results in increased pressure within the pleural space that provides external compression of the lung.^{4,5} (Figure 2)

If left untreated or unrecognized, respiratory effort may be compromised resulting in a lack of oxygenated blood being delivered to the vital organs of the body. Signs and symptoms of a pneumothorax include difficulty breathing, paleness or bluish discoloration of the skin, complaints of dizziness or nausea, vomiting, as well as pain in the chest which may radiate into the shoulders, upper extremities, or midscapular area. Two distinct physical signs occur with the pneumothorax; distended neck veins and tracheal deviation.⁵ Upon observation of the anterior aspect of the neck, one will note the distention of the veins present there. This is due to the increased pressure in the chest cavity and the inability of the venous blood to return easily from the head. The second sign is deviation of the trachea, which occurs away from the side of the chest in which the pneumothorax has occurred. This is also secondary to increased pressure within the chest cavity. This is a medical emergency and the athlete should be transported using the EMS system.

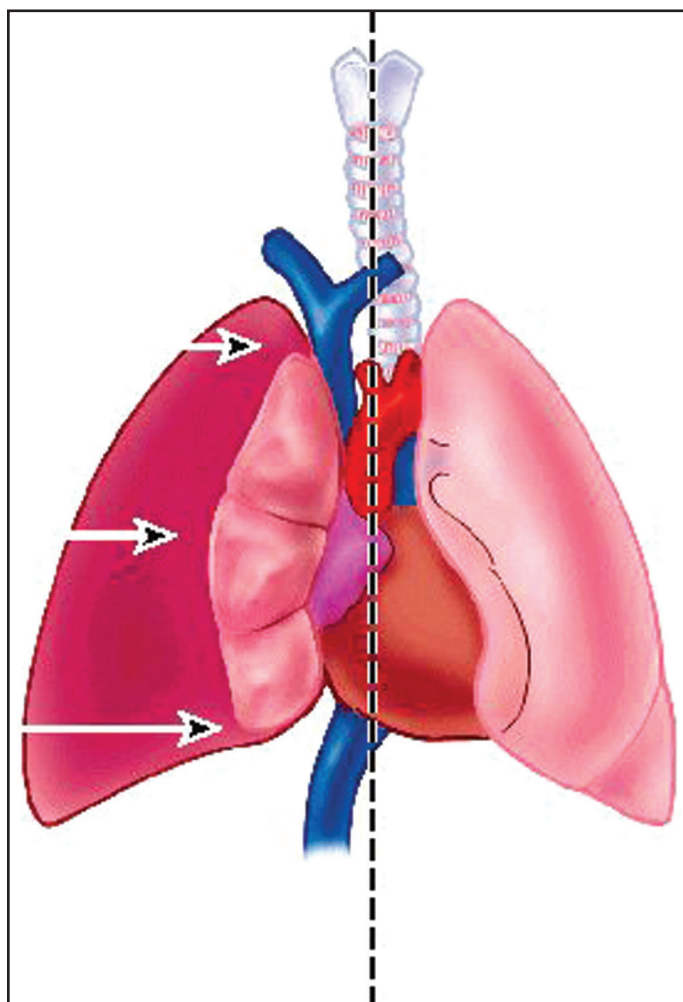


Figure 2. Graphic depiction of tension pneumothorax, arrows represent external pressure to the lung tissue on the left side of the figure.

Myocardial Contusion

Myocardial contusion occurs when the athlete is struck in the anterior aspect of the chest in the region of the heart. This blow, most commonly with an object or missile, results in bruising of the heart muscle.^{1,2} Less commonly, the chest of the athlete is struck with a fist or elbow of another athlete. As a result of the contusion, the heart will bleed into the pericardial sac resulting in compression of the heart muscle. Symptoms initially include difficulty breathing that is slow to resolve, restlessness of the athlete, a possible contusion over the heart with resultant bruising, and most importantly cardiac tamponade.^{1,2} Assessment of cardiac function is performed by monitoring the blood pressure of the athlete. In cases of true cardiac tamponade, the diastolic and systolic blood pressure will become closer in number. For example, the initial blood pressure may be

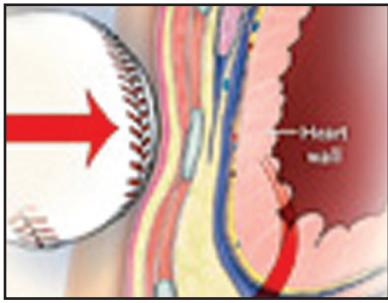


Figure 3. Possible mechanism of myocardial contusion.

160/70, when the pressure is taken at a later time the blood pressure becomes 150/80, then 140/90, then 130/100 with other concurrent symptoms such as chest pain, pain radiating into the left upper extremity and jaw as well as other signs of a myocardial infarction. This is a true medical emergency and the information regarding a possible cardiac tamponade should be relayed during the call to the emergency response operator. (Figure 3)

Commotio Cordis

Commotio Cordis also occurs when the athlete is struck in the chest with a missile or object, but differs from a myocardial contusion in that it occurs precisely at the beginning of the T-wave in the cardiac cycle.^{1,2,6}

This blow will immediately cause the heart to go into ventricular fibrillation which is life threatening. In their description of 70 cases of commotio cordis, Maron et al⁶ stated that the most common sports involved were youth baseball (n = 40), softball (n = 7), and ice hockey (n = 7). Seven (10%) of the 70 commotio cordis victims, including six with documented ventricular fibrillation, survived the consequences of their chest blow. Eleven of the events (16%) occurred despite the presence of chest padding believed to be potentially protective. The most effective way of restoring the normal cardiac cycle is with the use of the Automated External Defibrillator (AED).⁷ Although extremely rare in sports, this can occur with sports such as baseball, softball, karate, or other collision and contact sports where a blow to the chest is possible. The Sports PT

should be prepared to evaluate and manage this type of injury by having an AED present at all athletic events.⁷ Failure to restore cardiac rhythm may cause death of an otherwise healthy, normal athlete.

CONCLUSION

Although extremely rare in athletics, life threatening chest injuries can and do occur. Initial care of the chest injury includes determination of the mechanism of injury, initial evaluation of the athlete's airway, breathing, circulation, and level of consciousness. The safety of the scene must also be considered, but often is not a consideration in the sporting arena. Any deficits in the athlete's airway, breathing and circulation must be addressed first during the initial care of the chest injured athlete. The Sports PT must be aware of the signs and symptoms of serious chest injuries, be well prepared to handle cardiac emergencies by having an AED present, and be able to competently activate the emergency medical system. The Sports PT must also be able to monitor athlete's status and provide necessary emergency care until EMS arrives.

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