

## NON-CARDIAC CHEST PAIN IN ATHLETES

Number of Contact Hours: ½ hour

Description: Due to uncertainty and life-threatening conditions, chest pain can be a source of anxiety and concern for athletic trainers. The article discusses the causes, the recognition, and the treatment of non-cardiac chest pain.

List of Objectives:

1. Participants will be able to list three characteristics associated with exercise-induced asthma.
2. Participants will be able to list three sources of pulmonary sources of non-cardiac chest pain.
3. Participants will be able to identify three symptoms of hyperventilation.

## **Outline of Content:**

### **I. Introduction**

-the article discusses the causes, the recognition, and the treatment of non-cardiac chest pain

### **II. Causes**

- a. History: a specific cause of chest pain is not apparent in 21% to 39% of individuals
- b. Musculoskeletal sources
  1. Muscle strains
  2. Trauma
  3. Costochondritis
  4. Slipping rib syndrome
- c. Pulmonary sources
  1. Asthma
  2. Hyperventilation
  3. Spontaneous pneumothorax

### **III. Recognition**

- a. History
- b. Physical Exam
- c. Specific cardiovascular exam

### **IV. Treatment**

- a. Treatment varies with the source and cause of pain
- b. Musculoskeletal sources – ice, rest, nonsteroidal anti-inflammatory medication
- c. Pulmonary sources
  - a. Exercise-induced asthma- inhaler
  - b. Hyperventilation – slow, controlled breathing
  - c. Pneumothorax – medical emergency

## NON-CARDIAC CHEST PAIN IN ATHLETES

As a result of unfamiliarity, uncertainty, and life-threatening conditions, chest pain can be a source of anxiety for physicians and athletic trainers. Chest pain is not a common complaint among athletes. However, when an athlete experiences chest pain, it is usually benign and non-cardiac. Therefore, it is important for professionals such as athletic trainers to distinguish between non-cardiac and cardiac chest pain. The purpose of this paper is to discuss the causes, the recognition, and the treatment of non-cardiac chest pain (2).

### CAUSES

Despite a careful history, physical exam, and diagnostic studies, a specific cause of chest pain is not apparent in 21% to 39% of individuals. Although a detailed history and physical exam will provide a diagnosis, one third of the causes of non-cardiac chest pain are idiopathic (without a known cause). The specific causes that can be determined mainly result from either musculoskeletal or pulmonary sources. These two categories cover the majority of sources but several others also exist (2).

Musculoskeletal sources account for 15% to 31% of chest pain in younger individuals. Although the specific cause is difficult to determine, most musculoskeletal pain is increased by twisting the trunk. Several musculoskeletal origins include muscle strains, trauma, costochondritis, and slipping rib syndrome (2).

A specific cause of chest wall pain is a muscle strain. Overload and overuse are two factors evident during weight training that may cause a muscle strain. A second musculoskeletal origin of chest pain is trauma. Especially in collision or contact sports, trauma may result in a muscle contusion, soft-tissue contusion, or rib fracture. The mechanism of injury is usually a significant blow to the chest wall and most likely presents pain with palpation. Chest pain from a muscle strain or rib fracture can be caused by coughing (2).

Costochondritis is not usually a result from injury. It is generally characterized by unilateral pain during activity over the costochondral junctions. Pain, which varies with intensity, could increase with breathing and radiate to the back and abdomen. Minimal swelling and point tenderness are apparent. The last musculoskeletal origin of non-cardiac chest pain is slipping rib syndrome. With this unusual cause of chest pain in adolescents, pain may be reported in the upper abdomen or inferior costal areas and a slipping or popping may be present. The interruption of the fibrous attachment between ribs can lead to avulsion of the anterior end of the cartilage. This causes the loose end to curl up and rub the adjacent rib and intercostals nerve. The patient will definitely have pain with palpation (2).

Pulmonary sources of non-cardiac chest pain include asthma, hyperventilation, and spontaneous pneumothorax (2). The most common cause of exercise-related chest pain is exercise-induced asthma. Characteristics of exercise-induced asthma include burning chest pain, dry coughing, and dry wheezing during respiration. Additional symptoms of asthma include episodic wheezing, chest tightness, shortness of breath, and cough (5). Asthma is a result of difficult breathing caused by a narrowing of the bronchial tree. Both mucous secretions and bronchospasm cause this to increase.

While experiencing an asthma attack, an athlete has tightness in the chest with inspiration but has significant difficulty with expiration (11).

Hyperventilation is a frequent cause of chest pain. Several causes of hyperventilation include sport-related stress or a sudden, frightening traumatic event during competition. This traumatic event is usually associated with an injury such as a blow to the face or body by a ball (2). Decreasing levels of carbon dioxide and increasing levels of oxygen alter the body's gas levels which may result in dizziness (11). Other symptoms of hyperventilation include chest pain, anxiety (usually associated with losing), inability to catch one's breath, rapid deep respirations, tetany, numbness of lips and hands, and occasionally loss of consciousness. Statistics show that females are more likely to hyperventilate than males by as much as 30% to 70%. Two factors contribute to the rapid speed of how symptoms may develop during hyperventilation. First, the athlete may have continued exercising for a while before they recognize the symptoms. Also, the athlete could have a decreased amount of carbon dioxide which is further decreased by hyperventilation (6).

A pneumothorax is a condition where the pleural cavity is filled with air that has entered through an opening in the chest. The lung collapses as a negatively pressured pleural cavity fills with air (11). A pneumothorax usually develops as a result of high-energy blunt trauma to the chest or a penetrating wound. Causes of a pneumothorax include rib fractures, direct blows, and compression forces to the chest. Symptoms of a pneumothorax include chest pain, dyspnea, shortness of breath, diminished breath sounds, and labored breathing. Additional symptoms include an occasional dry, hacking cough, tightness in the chest, fall in blood pressure, and tachycardia (4). Since chest pain affects 80% to 90% of patients with a pneumothorax, it is the most common clinical symptom. Athletic trainers must be able to identify pneumothorax because it is one of very few on-field emergencies (12).

Other than musculoskeletal and pulmonary sources of non-cardiac chest pain, several other causes exist. Gastroesophageal reflux may cause chest pain with exercise. Symptoms include burning, retrosternal pain, heartburn, and abdominal cramps. Sometimes these symptoms will increase with exercise. In younger athletes, psychogenic causes of chest pain have also been reported. This may be due to social, psychological, mental, or physical stress in life. Abdominal conditions such as hernias and gallbladder disease may also refer pain to the chest. Lastly, substance abuse may lead to chest pain. This becomes a consideration with the increasing use of illegal substances (2).

## RECOGNITION

To determine the cause of chest pain, a careful history is necessary. Some general questions should be asked first. Examples of these questions include: how bad is your pain, what does it feel like, what makes the pain worse, and what were you doing when the pain started. The answers to these general questions may lead to questions concerning specific sources of pain. Several examples of these questions include: what type of sports or other activities are you involved in (musculoskeletal), do you feel pain after you eat (gastrointestinal), have your lips or fingers felt numb (hyperventilation), and have you had any conflicts or deaths among family or friends, failure in school, or fears (psychological). The responses to these questions can narrow the source of the non-cardiac chest pain (2).

Next, a physical exam should be performed. This exam focuses more on the common conditions. For example, inspecting and palpating the costochondral junction may produce point tenderness and reveal swelling. Pain may also be produced by palpating the muscles, soft tissue, and bones of the chest wall (2).

Recognition of the cause of non-cardiac chest pain is crucial in potentially fatal situations, including a pneumothorax. If left untreated, a pneumothorax results in a collapse of the lung tissue which may cause a mediastinal shift. This causes the collapsed lung to be pressed against the uninjured lung and heart which may reduce their functioning capacity and possible failure. A pneumothorax can also result in a tracheobronchial fracture or an esophageal rupture which potentially could have fatal complications (4).

Even when the history suggests a non-cardiac cause of chest pain, a thorough cardiovascular exam by a physician is necessary. In addition to eliminating cardiac sources as the cause of chest pain, the exam helps to relieve stress and worry in the athlete and their parents. First, any evidence of cyanosis, shortness of breath, and labored breathing are noted. The physician then looks for cardiomegaly (enlargement of the heart) by palpating and by percussing the heart to determine the size. Murmurs, extra heart sounds, and abnormalities in heart rate may be detected by auscultation. Finally, an abdominal exam is necessary to detect any conditions that may refer chest pain. A complete history, physical exam, and cardiac exam are necessary to recognize non-cardiac chest pain (2).

## TREATMENT

Treatment of non-cardiac chest pain varies with the source and cause of pain. Most non-cardiac chest pain resulting from musculoskeletal problems can be treated with ice, rest, and nonsteroidal anti-inflammatory medication. If the pain is tolerable, athletes can usually continue to practice in activities. However, patients with slipping rib syndrome may need a corticosteroid injection or surgery if conservative measures are not effective (2).

Athletes with pulmonary causes of chest pain are treated with different methods. Athletes with exercise-induced asthma are normally aware of their conditions and have medication in the form of an inhaler. The athletic trainer makes sure the inhaler is on hand and is easily accessible. The situation must be managed as a pulmonary emergency if the athlete does not have an inhaler. Since the primary problem is with exhaling rather than inhaling the athlete should perform slow, controlled breaths and use the abdominal muscles to push air out of the lungs. To assist in expiration, the athlete can be placed in a sitting position with the arms resting on the knees (2).

Athletic trainers play a key role in ensuring that the asthmatic athlete achieves the desired therapeutic outcomes, including minimizing the effect of asthma on athletic performance. The athletic trainer should take several steps including: ensure that the asthmatic athlete comply to the prescribed drug therapy for maximal benefit, be certain that the athlete use the inhaler properly, and refer the athlete to a physician if the asthma is not being controlled at an acceptable level (5).

Hyperventilation is usually treated having the athlete breathe in to a plastic or paper bag. By holding the bag tightly around the mouth and nose, the rate at which carbon dioxide is lost from the body is decreasing. Alternative methods are also

available. One method is to slowly exhale through the mouth and inhale through the nose. This does not increase the amount of carbon dioxide inhaled but symptoms of hyperventilation usually disappear within several minutes (6). Another method is to have the athlete hold one nostril closed and breathe through the opposite nostril (11).

An athlete who has been diagnosed with a pneumothorax by classic symptoms such as chest pain and dyspnea should be evaluated immediately because surgery is often required. Maintaining adequate ventilation is the primary goal of treatment. A clear airway should be maintained and vital signs should be monitored. Supplemental oxygen may be administered for respiratory support. Additional care for a suspected pneumothorax includes keep the athlete quiet and calm, placing the athlete in a sitting position, have the athlete try to control coughing and gasping, and do not give the athlete any fluids (4). Transport to an emergency room is required because chest injuries may rapidly decrease the athlete's respiratory status (12).

Treatments are available for other causes of non-cardiac chest pain. A gastroesophageal reflux can be treated with antacid or histamine H<sub>2</sub> antagonist. Avoiding exercise shortly after meals, eating smaller meals, and eliminating fatty foods from pre-exercise meals will help to decrease the risk of gastroesophageal reflux (10). Also, patients with psychogenic chest pain may require counseling if the symptoms progress (2).

## CONCLUSION

Overall, non-cardiac chest pain is not common among athletes. Several causes of chest pain have been identified. These include musculoskeletal, pulmonary, and other sources such as psychogenic causes. Recognition of non-cardiac chest pain is accomplished through a complete history, physical exam, and cardiac exam of the athlete. Finally, treatment of non-cardiac chest pain is important. Most treatment can be administered by an athletic trainer. However, in situations where an athlete has a pneumothorax, the athlete must be transported to the hospital. Overall, chest pain in athletes is usually benign and non-cardiac. Athletic trainers must be aware of the causes, how to recognize, and how to treat non-cardiac chest pain.

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1. A specific cause of chest pain is not apparent in \_\_\_\_\_% of individuals.
  - a. 40-60%
  - b. 21-39%
  - c. 62-78%
  - d. 5-18%
  
2. Pulmonary sources of non-cardiac chest pain include:
  - a. Asthma
  - b. Hyperventilation
  - c. Spontaneous pneumothorax
  - d. All of the above
  
3. A condition where the pleural cavity is filled with air that has entered through an opening in the chest is called:
  - a. Hyperventilation
  - b. Slipping rib syndrome
  - c. Pneumothorax
  - d. None of the above
  
4. The primary goal of treatment for a pneumothorax includes:
  - a. Decreasing pain
  - b. Maintaining adequate ventilation
  - c. Controlling coughing and gasping
  - d. Decreasing chest pain
  
5. Characteristics of exercise-induced asthma include:
  - a. Burning chest pain
  - b. Dry coughing
  - c. Dry wheezing during respiration
  - d. Shortness of breath
  - e. All of the above

6. Which of the following injuries is characterized by unilateral pain during activity over the costochondral junction?
  - a. Costochondritis
  - b. Hyperventilation
  - c. Spontaneous pneumothorax
  - d. Slipping rib syndrome
  
7. The following are signs of hyperventilation except:
  - a. Rapid deep respirations
  - b. Numbness of lips and hands
  - c. Tetany
  - d. Abdominal cramps
  
8. If left untreated, a pneumothorax can result in a collapse of the lung tissue which may cause a mediastinal shift.
  - a. True
  - b. False
  
9. With most non-cardiac sources of chest pain, if the pain is tolerable, athletes can usually continue to practice in activities.
  - a. True
  - b. False
  
10. All of the following are methods to decrease gastroesophageal reflux except:
  - a. Eliminating foods high in fat
  - b. Avoiding exercise shortly after meals
  - c. Eating larger meals
  - d. None of the above

## Non-Cardiac Chest Pain in Athletes

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## Non-Cardiac Chest Pain in Athletes

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