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## **Pediatric Chest Pain**

Chest pain is very common in children and teenagers. In 94-99% of cases there is no underlying disease causing it and there is nothing wrong with the heart. In fact, the pain is not even coming from the heart. The pain is real; kids are not “faking” the pain. The problem is that chest pain can be frightening for patients and families, especially since chest pain in adults may be caused by serious problems, and because pediatric chest pain can lead to missed school, restrictions from sports, and emergency room visits. This handout will help you better understand pediatric chest pain. It will also outline some of the more serious causes of chest pain.

**The majority of chest pain in pediatrics falls into the following categories:**

### **1. Chest wall pain**

Patients with this type of chest pain will often complain of sharp or stabbing pain but it is sometimes an aching or a pressure sensation. The pain may occur over the left or right chest or the breastbone. It can be random in nature and occur both at rest and/or with either light activity or with strenuous exercise. There is often an element of difficulty breathing where the pain is aggravated by taking deep breath or it is difficult to take in a deep breath. It is sometimes mistaken for asthma or reflux but it is neither of these. Chest wall pain is also not from the heart. Some episodes are caused by pain in the bones which would include the breastbone, the ribs, and the cartilage joints that link them together called the costochondral joints. Other episodes are caused by the muscles in the chest wall, which would include the Pectoral muscles, the muscles coming from the back called the Serratus Anterior, and finally the muscles between the ribs called the intercostal muscles. Episodes of chest pain can also be caused by the diaphragm, which is a large muscle shaped like a dome that is used by the lungs for breathing. Finally, a very common cause of chest wall pain is the lining around the lung called the pleura, which has a lot of nerve fibers. The causes of chest wall pain can vary day-to-day or episode-to-episode and often can result in the same type of pain.

Chest wall pain is very common in pediatrics. It can occur more frequently at times when people are experiencing stress or anxiety issues. The analogy here is headaches: Most human beings get headaches, but when we are under tremendous stress or having anxiety or depression we can have more headaches and a variety of other body symptoms. That does not mean that all headaches and all chest pain are due to stress and anxiety, but they can become more frequent at these times.

### **2. Overexertion symptoms**

We all have an upper limit or maximum ability when we exercise very hard. In highly trained athletes, the bones and muscles and cardiovascular system are so highly trained that it is rare to hit that limit. In less-trained or inactive individuals doing an unusual activity such as “running the mile” there can be quite a few children who experience overexertion symptoms. When we hit our limit we will be very tired, have trouble breathing, and sometimes have a burning or aching sensation in our chest. This will only occur when we are pushing ourselves very hard. Your doctor or cardiologist will be able to take a detailed history and do a detailed physical exam to determine whether you would benefit from having further testing for this type of pain.

### **3. Chest wall injury**

Kids can be very busy and in the heat of the moment of play and sports, they may not take note of an injury to the chest. This could mean being hit by a ball or another player or falling hard on the chest. This type of injury will not damage the heart and usually ribs do not break in children because they are mainly cartilage.

Sometimes in the next few days after the injury, pain will occur and the person may not remember that they had an injury to the area. This can often be treated with acetaminophen or ibuprofen, along with ice to the affected area.

### **4. Chest wall deformities**

There is a lot of normal variation in human anatomy. Some people may have a deformity of the chest wall and not even realize it. The most common type of deformity is one in which the chest is pushed in a bit, called **pectus excavatum**. Typically, this is just a cosmetic abnormality; in other words, the chest wall is not doing any damage to the lungs or the heart. People with pectus excavatum have a bit more chest wall pain than people with a completely normal chest wall shape. The analogy for this is a person who has a bunion on the foot; the bunion can hurt at times because there are abnormal stresses on that joint. Sometimes people with pectus excavatum can have an abnormal electrocardiogram purely because of the chest wall shape and so that further complicates the assessment and they may be referred to cardiologist for this reason. In rare cases, the pectus excavatum can be part of a syndrome with other problems.

## **What happens when someone is referred to the cardiologist for chest pain?**

At your appointment at the Pediatric Cardiology Center of Oregon, your child will be seen by an experienced full-fledged pediatric cardiologist. A detailed history, family history, and physical examination will be performed. Testing may include an electrocardiogram, echocardiogram, and possibly a heart rhythm monitor. An exercise test, or stress test, is only occasionally performed and sometimes combined with a breathing test called a pulmonary function test, and that would be done at a separate appointment if needed. It is rare that we need to do more testing such as a CT angiogram of the heart, cardiac MRI, angiogram, or electrophysiology study. Usually by the end of the appointment, all the testing and evaluation will be completed and you will leave with a very thorough explanation of the problem(s).

## **What can be done for chest pain?**

Unfortunately, there usually is no medication or specific therapy for the chest pain. The therapy is the realization that there is no underlying disease causing the pain. The pain is real and it can safely be ignored,

minimizing the emotional reaction to the pain which is the suffering component of "pain and suffering". People may find that taking shallow breaths helps. One should avoid body movements that aggravate the pain. It is also sometimes important to take a holistic approach to this problem since an increase in the frequency of chest pain may be tied to life changes or stresses and anxiety issues which are manifesting with an increase in body symptoms.

### **What else can cause chest pain?**

**Benign occasional causes**, meaning no serious disease:

**Gastroesophageal reflux:** This is over-diagnosed as a cause for chest pain. Typically, people with reflux will have a feeling of a burning sensation related to meals and if it is a chronic problem that can sometimes result in esophageal spasm, a spasm of the "food pipe" which feels like a squeezing type pain that comes in waves. We see this more with older teenagers.

**Asthma:** Asthma can be a cause of chest pain; however it is the diagnosis ONLY at the time when a person is coughing and wheezing and having shortness of breath. Asthma is not the cause of chest pain that is sharp and stabbing and limited by deep breath or worsened by deep breath when there is no associated coughing or wheezing. Most chest wall pain will have a component of difficulty breathing and will not respond to medications used for asthma because it is unrelated to asthma.

**Costochondritis:** This diagnosis is overused. It is my opinion that it is mainly referring to chest wall pain. True costochondritis is a form of arthritis of a specific joint between the breastbone and a rib. It is easy to diagnose because pushing on the site is very painful. It is not a common diagnosis. If a person truly has costochondritis, then medications such as NSAIDs for 2 weeks can be quite helpful. Costochondritis happens more as an overuse injury with sports involving the upper body, such as wrestling or baseball, or sometimes in teenage girls.

**Severe coughing:** People with bacterial pneumonia or whooping cough can sometimes cough so violently that it causes them to have chest pain. A pneumonia can irritate the lining of the lung, called the pleura, and this can cause chest pain as well. There are rare cases where children who have hand-foot-and-mouth disease may have chest pain at the same time.

**More serious causes or diseases resulting in chest pain** (occurring in 1-6% of patients):

**Hypertrophic cardiomyopathy:** This is a hereditary disease of the heart muscle that results in abnormal thickening and problems due to obstruction of blood flow leaving the heart. The chest pain will usually occur during exercise. Since it is a hereditary disease, any child of a person with hypertrophic cardiomyopathy or with a family history of this condition should be assessed by a pediatric cardiologist. These people can also faint with exercise, which is worrisome.

**Supraventricular tachycardia and other arrhythmias:** When people have rapid racing heart rates that are abnormal with rates above 200 bpm, there can be some mild pain or discomfort in the chest that results from that. With this situation, the episode first starts with a racing heart rate and the chest pain occurs later. On the

other hand, when people have benign chest wall pain, the pain and the fear reaction can increase the heart rate, but it will be typically well below 200 bpm.

**Pericarditis:** This is a rare condition where a viral infection or an autoimmune disease can cause inflammation in the pericardium, which is the lining around the heart. This tissue becomes inflamed and tender and produces a fluid which can compress the heart and become dangerous. The typical symptoms include constant chest pain that is aggravated by lying down and may sometimes be felt in the shoulder, along with decreased appetite and sometimes a fever. A doctor listening to the heart might hear a rub and there may be abnormalities on the EKG called ST changes. Some people may have myopericarditis, which is inflammation of both the heart muscle and the lining.

**Coronary artery disease:** Some people may be born with congenital abnormalities of the coronary arteries and they may have true heart pain (angina) with exercise. Some children may have had Kawasaki disease that resulted in damage to the coronary arteries that can result in angina. There are rare forms of hereditary cholesterol disorders that can cause angina and heart attacks in young people but it is more frequently in the 20s and 30s than in the teenage years.

**Pneumothorax:** A person with a collapsed lung can experience a lot of chest pain and have great difficulty breathing. This is diagnosed with a chest x-ray. It occurs mostly in tall young men and people with Marfans syndrome.

**Pulmonary embolus:** This is a very rare cause of chest pain in pediatrics but it can be seen in people with clotting disorders or teenage girls on birth control pills. Usually these two groups of people will have had another issue such as an illness or dehydration or surgery with prolonged immobilization that results in a situation where a pulmonary embolus can occur.

**Sickle cell disease:** People with sickle cell disease can have severe episodes of pain, including chest pain, which is a medical emergency treated in the emergency room and hospital.

**Aortic dissection:** There are rare conditions such as Marfan syndrome, Turner syndrome, and hereditary aortic dissection that can result in an enlarged aorta, which is called an aneurysm. When the tissue of this aneurysm starts to tear, it is extremely painful and it is felt as severe chest and back pain.

**Pulmonary hypertension:** These people have an abnormal elevation of blood pressure on the right side of the heart involving the lungs. They may have episodes of fainting with exercise, breathing difficulties, and rarely chest pain.