

## Investigation

# 3.5B: Chest Pain

As many as one quarter of all U.S. citizens may experience chest pain at one time or another. Over five million emergency room visits each year relate to chest pain. Even though the patient may feel certain a heart attack is in progress, not all chest pain comes from a heart attack; of course a cardiac cause must be ruled out before the patient leaves the emergency room. Fortunately more than half of the complaints of chest pain in the emergency room end up having another cause unrelated to the heart.

The Mayo Clinic classifies chest pain into five major categories: heart, digestive, bone and muscle, lung, and other. Let's take a look at each of these categories.

As we have discussed, cardiac causes of chest pain include myocardial infarction, angina, aortic dissection, and pericarditis. **A myocardial infarction** requires immediate treatment. Death (infarction means death) to part of the heart muscle results from a blockage to one or more of the arteries within the heart that supply oxygen to the muscle. That blockage can occur suddenly, but often occurs slowly as injuries to the walls of arteries heal by building up a coating called a plaque. As arteries become narrowed by plaque they deliver less blood flow and oxygen. The low flow stimulates the ischemic receptors to create a perception of pain that we call **Angina**. Patients experience angina especially during strenuous activities when the heart needs increased oxygen that the narrowed arteries cannot supply.

The aorta, the body's largest artery, carries the oxygenated blood leaving the heart going to the rest of the body. **Aortic dissection** describes a rupture of this vital structure. Such a tear or rupture can result in an almost sudden death. Before such a rupture occurs the wall of the aorta commonly weakens over time, and its diameter enlarges. Symptoms may not occur until the wall starts to leak blood or suddenly breaks open. Fortunately some aortic dissections do leak first and thus create discomfort before rupturing, and that allows surgeons an opportunity to repair the leak.

**Pericarditis** occurs when the protective sac or membrane surrounding the heart, called the **pericardium**, becomes infected or inflamed, Pericarditis may produce pain similar to angina or a myocardial infarction. An inflamed pericardial sac can leak fluid (a fluid similar to the serum portion of blood) into the area around the heart and that fluid can mechanically impede the heart's ability to pump blood.

All cardiac origins of chest pain call for immediate care. But as noted earlier, not all chest pain occurs due to heart problems.

Chest pain commonly occurs in disorders of the digestive system, primarily from the esophagus, gall bladder, or pancreas. **Heartburn** occurs when acid backwashes from the stomach and burns or irritates the inside of the esophagus. The esophagus conveys the food you eat from your mouth to your stomach. Inflammation of the **gall bladder** or **pancreas** located in the abdomen can produce pain that we say "**radiates**" into the chest. As the human body develops before birth these abdominal organs form initially high in the chest and migrate down into the abdomen taking with them the nerves that convey pain from inflammation. The brain still perceives that pain as coming from the chest even though the organ left that location during fetal development.

Disorders of bones and muscles surrounding the chest cavity can certainly cause chest pain. Bruised or broken **ribs**, inflammation of the **cartilage** joining your ribs to the sternum, called **costochondritis**, and injury to the **muscles** of the rib cage can all cause chest pain.

Besides the heart, the lungs reside in the chest. When evaluating chest pain a thorough evaluation of the lungs makes sense. We must rule out a pulmonary embolism, collapsed lung, pulmonary hypertension, and pleurisy. **Pulmonary embolism** occurs when a blood clot or other foreign material becomes lodged in a lung artery, making it difficult for the lung to exchange gases. A **collapsed lung** can occur spontaneously or due to injury when air leaks out of the lung or through the chest wall into the space between the lung and ribs. As more air leaks out into the space around the lung it becomes more and more difficult to breathe. **Pulmonary hypertension** occurs when the pressure in the arteries traveling to the lungs is above normal, a condition that can cause fluid to accumulate in the lung tissue. **Pleurisy** occurs when the membrane covering of the lungs becomes inflamed, making it painful to expand the lung during **inspiration**.

In addition to the definitive disorders involving the organs and body systems in and around the chest, other non-specific origins of chest pain can occur. Individuals can experience severe stress to a degree that makes them feel ill with chest and abdominal symptoms. **Panic attacks** fall into this category. Such attacks can create chest pain or tightness, rapid heartbeat, air hunger, and other symptoms similar to symptoms seen from a cardiac condition. Pain in the chest wall can also be experienced with an attack of **shingles**, a condition arising from a reactivation of the virus that previously caused a case of chicken pox.

Now you can appreciate the difficulty of managing an extremely agitated patient with chest pain. Although the list of possible causes might stretch one's imagination, and even though you may need to act quickly to avoid rapidly worsening symptoms, your job remains the same. You must rule out potential causes until the one valid explanation remains for you to treat. The stakes in unraveling this puzzle efficiently can easily represent life or death. Welcome to emergency medicine!