Diagnosis and Management of Chest Pain in the Emergency Department

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Abstract

Background: Chest pain is a common complaint and encompasses a broad differential diagnosis that includes several life-threatening causes. It is the second most common complaint in the emergency department comprising approximately 5% of all emergency department visits.

Aim: In this review, we will look into the diagnosis and management of chest pain in emergency department.

Methodology: The review is comprehensive research of PUBMED since the year 1996 to 2019.

Conclusion: Chest pain is a common symptom encountered in clinical practice. In most cases, a thorough medical history will provide a clue to the diagnosis. The key is to not miss a life threatening disorder like an acute MI or an aortic dissection. When the cause of chest pain remains unknown, it is recommended that the patient be referred to the specialist for care. The outcomes for patients with chest pain depend on the cause.

Keywords: Chest Pain; Emergency; Management of Chest Pain

Introduction

Chest pain is a common complaint and encompasses a broad differential diagnosis that includes several life-threatening causes. It is the second+ most common complaint in the emergency department comprising approximately 5% of all emergency department visits [1]. It is experienced by up to 25% of the general population in some way during their lifetime [2]. The rapid disposition and management of chest pain made possible by contemporary algorithms and pathways in emergency medicine and cardiology are credited with dramatic improvements in outcomes of patients with ACS [3].

When a patient experiences chest pain in the ED, addressing potentially life-threatening triggers is the top priority. For patients with non-life-threatening chest pain, a diagnosis may only be made after a full workout, including a comprehensive history, physical examination and some further investigations [4].

Patient satisfaction is important in its own right and should be taken seriously for a number of reasons. Firstly, it can be an important outcome measure determining compliance with the recommended treatment, re-attendance and soon. Secondly, it can be a useful way of assessing consultations and patterns of communication, identifying key areas for improvement. Thirdly, it allows for choices between alternatives in the organization or provision of health care [5].

Causes of chest pain

Acute chest pain is a clinical symptom caused by almost any condition that affects the thorax, abdomen, or internal organs. It may be broadly classified as originally somatic or visceral. Somatic pain involves musculoskeletal pain, major organ coverings and dermal tissues, while visceral pain includes pain from organs such as the heart, stomach, etc [6]. The distinction between cardiac and non-cardiac chest pain is one of the most significant factors in the assessment of chest pain. Discrimination between these two types of pain is often hard, as patients may have both cardiac and non-cardiac causes simultaneously. Non-cardiac causes are usual, but cardiac causes should not be ignored as heart chest pain may be a cardiovascular disease indicator (CVD) [7,8].

Non-cardiac causes

Approximately 20% to 30% of chest pain patients are classified as having non-cardiac chest pain based on standard cardiac catheterization results or other medical tests. About 200,000 new cases of non-cardiac chest pain occur in the US each year. Respiratory and pleuro-pulmonary disorders are common causes of non-cardiac chest pain. Pneumonia also causes pain in the chest located over the infection area [9,10].

Chest pain can also be associated with GI disorders like Gastroesophageal reflux (GERD), erosive (ERD) or non-erosive (NERD), Barrett's esophagus, Esophageal motility disorders (diffuse esophageal spasm, hypercontractile esophagus, achalasia), Hypersensitive esophagus, Schatzki's ring, webs, Eosinophilic esophagitis, Mallory-Weiss syndrome, Boerhaave syndrome, Drug-induced esophageal ulcer, Infection (viral, thrush, esophagitis), Gastroduodenal ulcer, Pancreatitis, biliary colic, cholangitis.

GERD-related chest pain is manageable, most often requiring a proton pump inhibitor. In addition, weight loss is advised in patients with GERD and non-cardiac chest pain, whether overweight or obese. Some lifestyle changes, including avoiding food causes and raising the head of the bed, may not completely alleviate GERD-related chest pain [11].

Costochondritis, an inflammation of a rib or cartilage attached to a lung, is one common cause of non-cardiac chest pain. Analgesics, local anesthetics, or anti-inflammatory agents reduce this disease. Infectious diseases like herpes zoster can also cause diffuse pain in the chest [12].

Injuries to the ribs, such as bruises, breaks, and fractures, can cause chest pain. A person may have heard a crack or felt extreme pain at the time of injury if they have a broken rib.

Cardiac causes

Other disorders include ACS, pulmonary embolism (PE), and aortic dissection. ACS is the most severe form of chest pain, potentially fatal. ACS, a specific classification that encompasses any disorder that results in myocardial ischemia ranging from unstable angina to acute myocardial infarction (AMI), is diagnosed in 15% to 25% of patients with chest pain [13,14].

Angina, the classic form of myocardial ischemia, is usually described as intense chest pressure or a feeling of squeezing or burning and is often accompanied by breathing difficulties. Angina usually radiates to the left shoulder, back, or arm and rises in strength for several minutes [15].

The most severe and fatal aortic emergency is acute aortic dissection, and it has the highest mortality rate among life-threatening causes of chest pains. Acute aortic dissection involves the sudden onset of intense, tearing pain that represents the location of the dissection and its development. Aortic dissection can also be associated with stroke, heart failure, syncope, lower extreme pain or fatigue, back and flank pain and abdominal pain [14,16].

Diagnosis

It is important to identify those patients with acute coronary syndromes (unstable angina, acute myocardial infarction, or evolving infarction). There are however a number of problems in recognizing these patients [17]. Chest pain may be confused with abdominal pain, particularly if the upper abdominal quadrants are epigastric or higher. The clinician should always bear in mind the presentations between those arbitrary classifications may be "traditional," "atypical" or intermediate. To assess the etiology of their pain, patients with chest pain syndrome should be diagnosed rapidly. Main measures that should be taking place in a time-critical manner are ECG and a concentrated history and physical exam. Unless the patient is hurried to the cardiac catheterization laboratory based on these three items, a chest X-ray should also be obtained quickly [18].

History, physical examination and a 12-lead electrocardiogram (ECG) are the first steps in the differential diagnostic process and generally allow the identification of characteristics which represent a high risk of life-threatening disease. If the ECG shows the elevation of the ST segment, it suggests cardiac catheterization. Measuring highly sensitive troponin values over time is a reliable test for the diagnosis or exclusion of acute myocardial infarction [19].

A complete history should be taken. Start by getting a good understanding of their complaint:

- Onset: In addition to when the pain started, ask what the patient was doing when the pain started. Was the pain brought on by exertion or were they at rest?
- Location: Can the patient localize the pain with one finger or is it diffuse?
- Duration: How long did the pain last?
- Character: Let the patient describe the pain in his or her own words.
- Aggravation/alleviating factors: It is very important to find out what makes the pain worse. Is there an exertional component, is it associated with eating or breathing? Is there a positional component? Don't forget to ask about new workout routines, sports, and lifting. Ask what medications they have tried.
- Radiation: This may clue you into visceral pain.
- Timing: How many times do they experience this pain? For how long does it let up?

Ask about other symptoms such as:

- Shortness of breath
- Nausea and vomiting
- Fever
- Diaphoresis
- Cough

- Dyspepsia
- Edema
- Calf pain or swelling
- Recent illness.

Carefully review the patient's medical history for cardiac history, coagulopathies, and kidney disease. Ask about family history, especially cardiac, and ask about social histories like drug use and tobacco use [20].

Physical examination can then be done as follow [21]:
- Full set of vitals including blood pressure (BP) measurements in both arms
- General appearance, noting diaphoresis and distress
- Skin exam for the presence of lesions (shingles)
- Neck exam for jugular venous distension (JVD), especially with inspiration (Kussmaul sign)
- Chest, palpate for reproducible pain and crepitus
- Heart exam
- Lung exam
- Abdominal exam
- Extremities for unilateral swelling, calf pain, edema, and symmetric, equal pulses.

The doctor should ask for immediate tests like:
- **Electrocardiogram (ECG):** This examination tracks the heart's electrical activity by adding electrodes to the skin. Because the damaged heart muscle usually does not produce electrical impulses, the ECG can indicate if the patient has had a heart attack or is having one.
- **Blood tests:** To test that certain proteins or enzymes normally found in the heart muscle have increased levels. Damage to heart cells from a heart attack may allow these proteins or enzymes to leak, over a period of hours, into blood.
- **Chest X-ray:** A chest X-ray helps doctors to check the lung condition and heart size and shape, as well as major blood vessels. Also, an X-ray in the chest can reveal lung problems like pneumonia or a collapsed lung.
- **Computerized tomography (CT scan):** CT scans may detect a blood clot in the lung (pulmonary embolism) or make sure that the aortic dissection is not present.

Diagnosis is made on the presence of an ischemic ECG, suggestive clinical history, or the presence of circulating biomarkers of myocardial necrosis (Troponin). For order to reach a diagnosis of myocardial infarction, two of these three variables must be present. However, 40% to 60% of people subsequently diagnosed with ACS present with an initial non-diagnostic ECG at the ED [22]. However, some of these patients will not have elevated troponin and those with unstable angina will not have elevated troponin at any stage unless they continue to develop an MI. This means that the only way these people can initially be recognized is through the history of the presenting complaint. The full extent of coronary artery disease is often unknown until the patient undergoes intrusive testing, such as coronary angiography [23,24].

The ECG is an excellent tool for RIMI, because it is highly specific (77% - 100%) depending on the parameters used. However, the sensitivity of ECG in the first 12 hours is poor (28 percent - 54 percent), and the presence of a normal ECG does not exclude AMI, nor does it provide sufficient assurance to discharge the patient from the ED. At this stage, therefore, the ECG is a tool to identify patients for consideration of fibrinolytic drugs [25,26].

Troponins are proteins that form the regulatory complex for tropomyosin (TRC). The TRC regulates the actin-myosin complex in muscle. Troponin T and I in the heart muscle are unusual in that they are formed virtually only by cardiac myocytes [27].

Management

Efforts to improve the efficacy of the evaluation of chest pain patients in the ED have included incorporation of newer diagnostic strategies and modalities, such as new cardiac biomarkers and noninvasive imaging. The value of using a systematic approach to treat chest pain patients can be measured in several ways [28].

Patients with chest pain who meet ACS criteria should be placed on a heart monitor, intravascular access (IV) should be established, 162 mg to 325 mg chewable aspirin, clopidogrel or ticagrelor (unless bypass surgery is imminent), pain control and oxygen (O_2) treatment should be considered. Nitroglycerin has shown a mortality benefit, aim for 10% mean arterial pressure (MAP) reduction in normotensive patients and 30% MAP reduction in hypertensive patients; avoid in hypotensive patients and those with inferior ST elevation. Patient with ST elevation on ECG patients should receive immediate reperfusion therapy either pharmacologic (thrombolytics) or transfer to the catheterization laboratory for percutaneous coronary intervention (PCI) [33].

Patient with chest pain, who do not meet criteria for ACS:

- Sublingual nitroglycerin may be given in the treatment of painful symptoms; resolution of symptoms does not infer a diagnosis of myocardial ischemia, nor does a lack of relief infer an alternative diagnosis.
- Oxygen (2 to 4L via nasal cannula)
- Aspirin 325 mg PO
- Pain control (morphine 2 to 5 mg IV q5 to 15 min).

Drugs used to treat some of the most common causes of chest pain include [29-33]:

- **Artery relaxers:** Usually taken as a tablet under the tongue, nitroglycerin relaxes heart arteries, thus allowing blood to flow more easily through the narrow spaces. Many drugs for blood pressure also relax and expand the blood vessels.
- **Aspirin:** If doctors suspect that your chest pain is related to your heart, you'll likely be given aspirin.
- **Thrombolytic drugs:** Patient can receive these clot-busting drugs if the cases are a heart attack. These work to dissolve the clot which blocks blood from reaching the muscle of your heart.
- **Blood thinners:** When a clot in an artery that feeds the heart or lungs, medications that stop blood clotting to keep further clots from forming.
- **Acid-suppressing medications:** When chest pain is caused by the splashing of stomach acid into your esophagus, the doctor may prescribe medicines that reduce the amount of acid in your stomach.
- **Antidepressants:** Doctor may prescribe antidepressants to help control the symptoms if the patient is having panic attacks. Psychological intervention, for example cognitive behavioral therapy, may also be recommended.

Conclusion

Chest pain is a common symptom encountered in clinical practice. In most cases, a thorough medical history will provide a clue to the diagnosis. The key is to not miss a life threatening disorder like an acute MI or an aortic dissection. When the cause of chest pain remains unknown, it is recommended that the patient be referred to the specialist for care. The outcomes for patients with chest pain depend on the cause.

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