Original Article

Evaluation of Acute Chest Pain Management in Emergency Department

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Abstract

Background: Chest pain is the most presented complain to the emergency departments worldwide. The high rate of mortality and morbidity and the wide variety of its causes increase the burden on physicians and health organizations. Accurate workup and guidance is required in managing these patients in ER. Many life-threatening conditions are simply presented with chest pain, making the ER role crucial to achieve the exact diagnosis and determine further treatment steps. **Objectives:** In this review, we aim to assess acute chest pain presentation in an emergency department and provide a summarized, yet comprehensive paper. **Methodology:** PubMed database was used for articles selection using the keywords Chest Pain, Diagnosis, and Management. **Conclusion:** Acute chest pain can arise as a result of different etiologies, such as ischemic heart diseases, pneumonia, heart failure and pulmonary embolism. The role of emergency physician during the initial evaluation is to rule out ischemic heart diseases and assess if the condition needs further evaluation and testing. The physician should assess the patient characteristics, risk factors and 12 lead ECG that can help in ruling out ischemic heart diseases. When other diagnosis is suspected, the physician should evaluate the related signs and symptoms in order to confirm the diagnosis.

Keywords: Acute Chest pain, ischemic heart disease, emergency department

Introduction

Chest pain is considered as one of the most common complaints among patients presenting to the emergency departments, outpatient clinics, and primary care centers [1]. Its related life-threatening conditions makes the diagnostic strategies and management plan crucial to achieve in a precise and accurate manner. The high rate of mortality and morbidity associated with deficient management of chest pain takes a big toll on the health organizations' budgets, and the subsequent complications affect the general population's health and wealth. Thus, having well-trained ER physicians, proper awareness programs, and high quality centers is a must when dealing with such patients [2]. In this review, we will assess the common role of ER physicians, updated treatment guidelines and stepwise approach in management of acute chest pain.

Methodology

PubMed database was used for articles selection using the keywords Chest Pain, Diagnosis, and Management. With regard to the inclusion criteria, the articles were selected based on the inclusion of one of the following topics; chest pain evaluation, diagnosis, evaluation, management, and treatment. Exclusion criteria were all other articles which did not have one of these topics as their primary endpoint.

Discussion

Acute chest pain (ACP) is considered as one of the commonest presentations in emergency department. Patients with ACP usually complain of chest pressure, fatigue, nausea, drowsiness and difficulty in breathing. Patients with ACP

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may face a rapid deterioration in their condition. Thus, emergency physician should always accurately assess, manage and identify the underlying causes behind patients' presentation within a tight window of time. The most common causes of ACP presentation in ER include GERD, acute coronary syndromes (ACS), pulmonary embolism, pneumonia, aortic dissection and tension pneumothorax (see Table 1) [1, 2].

Table 1. Differential Diagnosis of Chest Pain

Diagnosis	Clinical Findings
Acute Myocardial Infarction	• Chest pain radiates to both arms • Third heart sound on auscultation3 • Hypotension
Chest Wall Pain	At least two of the following findings: localized muscle tension; stinging pain; pain reproducible by palpation; absence of cough
GERD	Burning retrosternal pain, acid regurgitation, sour or bitter taste in the mouth; one-week trial of high-dose proton pump inhibitor relieves symptoms
Panic Disorder/ anxiety	Single question: In the past four weeks, have you had an anxiety attack
Pericarditis	Clinical trial of pleuritic chest pain (increases with inspiration or when reclining, and is lessened by leaning forward), pericardial friction rub, and electrocardiographic changes (diffuse ST segment elevation and PR interval depression without T wave inversion)
Pneumonia	• Egophony • Dullness to percussion • Fever
Heart Failure	• Pulmonary edema on chest radiography • Clinical impression/judgment • History of heart failure • History of acute myocardial infarction
Pulmonary Embolism	• High pretest probability based on Wells criteria • Moderate pretest probability based on Wells criteria • Low pretest probability based on Wells criteria
Aortic Dissection	Acute chest or back pain and a pulse differential in the upper extremities

Initial Evaluation

There have been no clinical studies presenting a specific approach for the diagnosis and workup of patients presented with ACP so far. Emergency physicians should always consider ischemic heart diseases (IHD) as a cause of ACP unless the actual cause is clearly apparent. The first factor considered by treating physicians is whether or not the patient presentation with ACP is caused by IHD [1].

IHD occurs due to formation of a vulnerable atherosclerotic plaque, which consists of inflammatory cells, lipid accumulations and remnants or erosions of the coronary artery endothelium. However, as the plaque increases in size, the blood supply to the heart tissue is diminished which precipitates angina and thus clinical symptoms. Variant risk factors were identified to be associated with IHD development such as aging, male gender, Hispanic and Afro-American race, obesity, hyperlipidemia syndrome, diabetic, hypertension, smoking and having previous cardiac issues (especially ST –segment abnormalities). IHD include Angina, Unstable angina and Myocardial infarction (MI). Angina is defined as deep, poorly localized chest discomfort (pain or pressure) that is associated with emotions, physical activity and relived with rest or sublingual nitrate [3]. Unstable angina is defined as pain at rest, new onset angina, or angina that has become more sever [4]. According to the World Health Organization, myocardial infarction (MI) is considered if two out of three pillars are present, the classical symptoms of chest pain, presence of ischemic change (Q waves) in the ECG, and increased blood specific enzymes [5]. MI is subdivided based on the pathophysiological changes that are seen in the ECG into ST-segment elevation myocardial infarction (STEMI), and non-STEMI (NSTEMI). In patients suspected with IHD a complete history, physical examination and initial ECG should be done [6]. Additionally, ER physician should evaluate if the case needs further testing (e.g., troponin I or stress testing, coronary angiography) to rule in or out a potentially IHD and acute MI. A recent published meta-analysis mentioned that history and physical examination are not enough to diagnose IHD or MI, especially in patients with low risk [7].

Although physicians cannot depends on patients' characteristics to role in or out diagnosis, a combination with signs and symptoms will rise the diagnostic accuracy [8]. Acute MI likelihood is increased in male gender, age >60 years, radiated pain to the left shoulder, jaw, neck, arm and history of angina [9]. Additionally, MI likelihood is increased when pain radiates to both arms, a third heart sound is found on auscultation and the patient is hypotensive. A physician should keep in mind that pleuritic, sharp or chest pain that is increased with palpations lower the likelihood of MI [10]. The patient should be evaluated for the presence of comorbidities, such as diabetes mellitus, cigarette smoking, and dyslipidemia that are associated with escalating the likelihood of MI development [11].

Bosner et al. developed a clinical score that can help in predicting the likelihood of coronary artery disease (CAD) development (see Table 2). The clinical prediction score included known coronary artery disease, age/sex concerning 55 years or older in men and 65 years or older in women), occlusive vascular dis-ease, or cerebrovascular disease, pain that is worse during exercise, patient assumption that the pain is of cardiac origin, and pain not reproducible by palpation. Bosner et al. mentioned that among patients with no or one clinical factors only 1% developed CAD. On the other hand,

63% of the patients who had 4-5 clinical factors developed CAD. The study concluded that any patient presented to ER with 4-5 of the clinical predictive factors should have a close monitoring and further evaluation of his condition [12].

Table 2. The Validated Clinical Decision Rule to Predict CAD as a Cause of Chest Pain

Component	Points
• Age/sex: men 55 years or older, women 65 years or older	1
• Known vascular disease (CAD, occlusive vascular disease, cerebrovascular disease)	1
• Pain worse with exercise	1
• Pain not elicited with palpation	1
• Patient assumes pain is of cardiac origin	1
Likelihood of Coronary Artery Disease as a Cause of Chest Pain	
Score	Positive Likelihood Ratio / Negative Likelihood Ratio
0 to 1 point	1.09 / 0.00
2 to 3 points	1.83 / 0.03
4 to 5 points	4.52 / 0.16

ECG is the test of choice for initial assessment of patient presented with symptoms of ACP. ECG finding has a significant effect on the likelihood of IHD or MI diagnosis. The elevation (or even reciprocal depression) in the ST segment reflects the location of the infarction, presence of Q wave, new onset of left bundle branch bock or reversed T wave. Patients' evaluation based on clinical assessment (history, physical examination, risk factors, and 12-lead ECG) will help the physician to reach a decision whether to manage the case as IHD or look for other causes of ACP.

Other Diagnostic Considerations

When the cardiac causes of ACP are ruled out, other differentials should be evaluated. A physician should do a complete patient evaluation to reach a final diagnosis.

• *Chest Wall Pain*

Bonser et al. elaborated four clinical factors that can help in prediction and assessment of a patient suspected with chest wall pain: cough presence, localized muscle tension, pain reproducible by palpation, and stinging pain. Patients with 2 or more of these clinical factors at time of presentation to ER department have 77% positive likelihood of having chest wall pain [13].

Costochondritis also called (Tietze sndrome) is a subset of chest wall pain, in which pain is reproduced as a result of palpation near to the parasternal/ costochondral joint. Diagnosis of Costochondritis is made clinically and does not need any diagnostic measures [14].

• *GERD*

Patients with GERD usually present with a retrosternal burning pain, acid regurgitation and pain associated with certain types of food. At the moment, no available data have suggested any technique that can be done during the physical examination that can help in diagnosis. A good history taking and evaluation of patients' symptoms may help in exclusion of other differentials. One-week high dose of proton pump inhibitor can help in diagnosis [15].

• *Pericarditis*

Pericarditis characterized with a triad of chest pain, pericardial friction rub, and diffuse ECG ST-T wave changes (ST segment elevation and PR interval depression without T wave inversion). ER physician should suspect the diagnosis when the patient complain of increase pain when leaning forward or during inspiration [16, 17].

• *Pneumonia*

Patients with pneumonia present with fever, chills, productive cough and pleuritic chest pain. During the physical examination, egophony and dullness can be found. Diagnostic radiography is considered as the test of choice for diagnosis [18].

• *Heart Failure*

These patients may complain of dyspnea on physical activity, sweating and paroxysmal nocturnal dyspnea. Clinical assessment and impression is predictive of heart failure. Additionally, chest radiography may show pulmonary edema [19].

• *Pulmonary Embolism*

Diagnosis of pulmonary embolism may be challenging for the health care provider as a result of various presentations. In most of the cases, patients present wit dyspnea, tachycardia, and/or chest pain. So far, no data have provided a single feature that can help in conforming the diagnosis [20]. Wells et al. presented a clinical criteria that can help physicians to evaluate the patients suspected with pulmonary embolism and decide if further tests need to be done, such as d-dimer assay, ventilation-perfusion scan, and helical computed tomography of the pulmonary arteries (see Table 3).

Table 3. Wells Criteria for Pulmonary Embolism (PE) Diagnosis

Component	Points
• Clinical signs of deep venous thrombosis (asymmetric leg swelling, palpable calf pain)	3
• Diagnosis of PE is more likely than an alternative diagnosis	3
• Heart rate greater than 100 beats per minute	1.5
• Previous diagnosis of DVT or PE	1.5
• Bed rest immobilization or surgery within the past four weeks	1.5

• Hemoptysis	1
• Malignancy within the last 6 months	1

Probability of PE

Score	Risk of PE	Probability of PE (%)
0 to 1 point	Low	0.00
2 to 6 points	Moderate	0.03
Greater than 6 points	High	0.16

Conclusion:

Acute chest pain can arise as a result of different etiologies, such as ischemic heart diseases, pneumonia, heart failure and pulmonary embolism. The physician should assess the patient characteristics, risk factors and 12 lead ECG that can help in ruling out ischemic heart diseases. When other diagnosis is suspected, the physician should evaluate the related signs and symptoms in order to confirm the diagnosis.

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