

EBM CONFERENCE

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CLINICAL SCENARIO

- A 55-year-old woman with cardiac-sounding chest pain presents to the emergency department.
- The first ECG is normal. Just before you discharge him, you stop to wonder what the sensitivity of the initial 12 lead ECG is in predicting acute myocardial infarction.

Background question

- Question 1: What's the differential diagnosis of chest pain ?
- Question 2: the definition of acute myocardial infarction
- 資料出處：
- Harrison's Principles of Internal Medicine, 17th Edition, by Anthony S. Fauci , Eugene Braunwald , Dennis L. Kasper , Stephen L. Hauser , Dan L. Longo , J. Larry Jameson , Joseph Loscalzo

Question 1: What's the differential diagnosis of chest pain ?

Table 13-2 Typical Clinical Features of Major Causes of Acute Chest Discomfort

Condition	Duration	Quality	Location	Associated Features
Angina	More than 2 and less than 10 min	Pressure, tightness, squeezing, heaviness, burning	Retrosternal, often with radiation to or isolated discomfort in neck, jaw, shoulders, or arms—frequently on left	Precipitated by exertion, exposure to cold, psychologic stress S ₄ gallop or mitral regurgitation murmur during pain
Unstable angina	10–20 min	Similar to angina but often more severe	Similar to angina	Similar to angina, but occurs with low levels of exertion or even at rest
Acute myocardial infarction	Variable; often more than 30 min	Similar to angina but often more severe	Similar to angina	Unrelieved by nitroglycerin May be associated with evidence of heart failure or arrhythmia
Aortic stenosis	Recurrent episodes as described for angina	As described for angina	As described for angina	Late-peaking systolic murmur radiating to carotid arteries
Pericarditis	Hours to days; may be episodic	Sharp	Retrosternal or toward cardiac apex; may radiate to left shoulder	May be relieved by sitting up and leaning forward Pericardial friction rub
Aortic dissection	Abrupt onset of unrelenting pain	Tearing or ripping sensation; knifelike	Anterior chest, often radiating to back, between shoulder blades	Associated with hypertension and/or underlying connective tissue disorder, e.g., Marfan syndrome Murmur of aortic insufficiency, pericardial rub, pericardial tamponade, or loss of peripheral pulses

Question 1: What's the differential diagnosis of chest pain ?

Pulmonary embolism	Abrupt onset; several minutes to a few hours	Pleuritic	Often lateral, on the side of the embolism	Dyspnea, tachypnea, tachycardia, and hypotension
Pulmonary hypertension	Variable	Pressure	Substernal	Dyspnea, signs of increased venous pressure including edema and jugular venous distention
Pneumonia or pleuritis	Variable	Pleuritic	Unilateral, often localized	Dyspnea, cough, fever, rales, occasional rub
Spontaneous pneumothorax	Sudden onset; several hours	Pleuritic	Lateral to side of pneumothorax	Dyspnea, decreased breath sounds on side of pneumothorax
Esophageal reflux	10–60 min	Burning	Substernal, epigastric	Worsened by postprandial recumbency Relieved by antacids
Esophageal spasm	2–30 min	Pressure, tightness, burning	Retrosternal	Can closely mimic angina
Peptic ulcer	Prolonged	Burning	Epigastric, substernal	Relieved with food or antacids
Gallbladder disease	Prolonged	Burning, pressure	Epigastric, right upper quadrant, substernal	May follow meal
Musculoskeletal disease	Variable	Aching	Variable	Aggravated by movement  May be reproduced by localized pressure on examination
Herpes zoster	Variable	Sharp or burning	Dermatomal distribution	Vesicular rash in area of discomfort
Emotional and psychiatric conditions	Variable; may be fleeting	Variable	Variable; may be retrosternal	Situational factors may precipitate symptoms Anxiety or depression often detectable with careful history

Question 2 the definition of acute myocardial infarction

- Pt's with ischemic heart disease fall into two large groups: patients with chronic coronary artery disease (CAD) who most commonly present with stable angina & pt's with acute coronary syndromes (ACSs).
- The latter group, in turn, is composed of patients with acute myocardial infarction (MI) with ST-segment elevation on their presenting electrocardiogram (STEMI) and those with unstable angina and non-ST-segment elevation MI (UA/NSTEMI).

Question 2 the definition of acute myocardial infarction

- WHO criteria, International diagnostic criteria for acute myocardial infarction and acute stroke. Am Heart J 1984;108:150-8. PMID 6731265
- Classically diagnose MI: if two (probable) or three (definite) of the following criteria are satisfied:
 - Clinical history of ischemic type chest pain lasting for more than 20 minutes
 - Changes in serial ECG tracings
 - Rise and fall of serum cardiac biomarkers such as creatine kinase-MB fraction and troponin

Question 2 the definition of acute myocardial infarction

Definition of MI. *Criteria for acute, evolving or recent MI.* Either one of the following criteria satisfies the diagnosis for an acute, evolving or recent MI:

- 1) Typical rise and gradual fall (troponin) or more rapid rise and fall (CK-MB) of biochemical markers of myocardial necrosis with at least one of the following:
 - a) ischemic symptoms;
 - b) development of pathologic Q waves on the ECG;
 - c) ECG changes indicative of ischemia (ST segment elevation or depression); or
 - d) coronary artery intervention (e.g., coronary angioplasty).
- 2) Pathologic findings of an acute MI.

Myocardial Infarction Redefined—A Consensus Document of The Joint European Society of Cardiology/American College of Cardiology Committee for the Redefinition of Myocardial Infarction; Journal of the American College of Cardiology Volume 36, Issue 3, September 2000, Pages 959-969

Foreground questions

- While patients presenting to the ED with cardiac-sounding chest pain, what is the sensitivity of the initial 12 lead ECG?

Problem	While patients presenting to the ED with cardiac-sounding chest pain, what is the sensitivity of the initial 12 lead ECG?
Intervention	First Electrocardiogram while patients presenting to the ED with cardiac-sounding chest pain
Comparison	diagnosis of AMI by WHO criteria
Outcome	the sensitivity of the initial 12 lead ECG

SEARCH FOR EVIDENCE

- Database used: Medline from 1966 using the OVID interface
- Keywords: myocardial infarction, AMI , electrocardiography, electrocardiogram , ECG, EKG, filter LIMIT to human and English.
- Results: 543 papers were found, out of which 535 were irrelevant or of insufficient quality. The remaining 8 papers are shown below

RELEVANT PAPER-1

- First Electrocardiogram in recent Myocardial Infarction, Mc Guinness JB, Begg TB, Semple T., *BMJ* 1976 ; 2(6033) : 449-51
- Patient group: 898 patients admitted to CCU. 400 with AMI
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 51%
- CCU population not ED

RELEVANT PAPER-2

- Early peak of creatine kinase MB in acute myocardial infarction with a nondiagnostic electrocardiogram, Sharkey SW, Apple FS, Elsperger KJ, et al., American Heart Journal 1988 ;116(5):1207-11.
- Patient group: 34 patients admitted to CCU. 34 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 61%
- CCU population not ED
- Small population size

RELEVANT PAPER-3

- Clinical Characteristics and Outcome of Acute Myocardial Infarction in Patients with Initially normal or Non-specific Electrocardiograms., Rouan GW, Lee TH, Cook EF et al., Am J Cardiol 1989;64(18):1087-92
- Patient group: 918 ED chest pain patients. 811 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 13%

RELEVANT PAPER-4

- Acute Myocardial Infarction in Chest Pain Patients with Non-diagnostic ECGs: Serial CK-MB Sampling in the Emergency Department, Gibler WB, Young GP, Hedges JR, et al., Ann Emerg Med 1992;21(5):504-12.
- Patient group: 616 ED chest pain patients. 108 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 36% (39人)

RELEVANT PAPER-5

- Assessing the Diagnostic Value of an ECG Containing Leads V4r, V8 and V9: The 15 lead ECG., Zalenski RJ, Cooke D, Rydman R, et al., Ann Emerg Med 1993;22(5):786-93.
- Patient group: 149 ED chest pain patients. 34 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 47.1 %

RELEVANT PAPER-6

- The role of Single ECG, Creatinine Kinase and CKMB in diagnosing patients with acute chest pain, Young GP and Green TR., AJEM 1993;11(5):444-9.
- Patient group: 222 ED chest pain patients. 43 with AMI
- Study type (level of evidence): Retrospective survey
- Outcomes(Sensitivity of initial ECG): 28 %
- Retrospective study
- population mostly elderly

RELEVANT PAPER-7

- Utility of the Prehospital Electrocardiogram in Diagnosing Acute Coronary Syndromes: The Myocardial Infarction Triage and Intervention (MITI) Project., Kudenchuk PJ, Maynard C, Cobb LA, et al., J Am Coll Cardiol 1998;32(1):17-27.
- Patient group: 3027 ED chest pain patients. 1149 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 69 %

RELEVANT PAPER-8

- Usefulness of Automated Serial 12-Lead ECG Monitoring During the Initial Emergency Department Evaluation of Patients With Chest Pain., Fesmire FM, Percy RF, Bardoner, JB et al., Ann Emerg Med 1998;3(1):3-11.
- Patient group: 1000 ED chest pain patients. 204 with AMI.
- Study type (level of evidence): Prospective diagnostic cohort
- Outcomes(Sensitivity of initial ECG): 55.4 %

證據等級

Level	與[治療/預防/病因/危害]有關的文獻
1a	用多篇RCT所做成的綜合性分析(SR of RCTs)
1b	單篇RCT(有較窄的信賴區間)
1c	All or none
2a	用多篇世代研究所做成的綜合性分析
2b	單篇cohort及低品質的RCT
2c	Outcome research / ecological studies
3a	SR of case-control studies
3b	Individual case-control studies
4	Case-series (poor quality :cohort / case-control studies)
5	沒有經過完整評讀醫學文獻的專家意見

GRADES OF RECOMMENDATION

A	consistent level 1 studies
B	consistent level 2 or 3 studies <i>or</i> extrapolations from level 1 studies
C	level 4 studies <i>or</i> extrapolations from level 2 or 3 studies
D	level 5 evidence <i>or</i> troublingly inconsistent or inconclusive studies of any level

總結與討論

- At presentation history, clinical findings and ECG are all that are available to aid clinicians in the diagnosis of AMI.
- These studies have shown that the first ECG is between 13-69% sensitive for AMI.
- The first ECG is not sensitive enough to rule out AMI in the Emergency Department.

Thank you for paying attention!