Recipe For Admission: Atypical Chest pain and Incorrect Lead Placement

K. Spinks, MD; A. Arbour, MD; J Amoss, MD
Louisiana State University Health Sciences Center, Department of Medicine
New Orleans, LA 70112

Introduction

• Chest pain is the most common primary complaint in adult patients presenting to the Emergency Department in US.
• 2007- More than 5 million ED visits for chest pain in US

According to the American Heart Association guidelines for managing chest pain, the first EKG should be done in the first ten minutes of arrival to ED in order to risk stratify patients.

• These two facts result in millions of EKGs being utilized as a cornerstone in diagnosing cardiac causes of chest pain each year.
• We present a case where EKG lead misplacement significantly alters management.

Case Report

A 41 year old African American male with no significant past medical history presented to the Emergency Department with a chief complaint of chest pain, 5/10 in severity that began while at rest and had been constant since the evening prior to presentation. His chest pain was located in his left anterior chest. It radiated into his shoulder and left arm but was not associated with activity, shortness of breath, nausea, or vomiting. He had not noted this chest pain intermittently over the past two months. On arrival to the Emergency Department, the patient appeared comfortable, and all vital signs were within normal limits. His physical exam was unremarkable, and his first set of cardiac enzymes were normal.

On initial EKG, the patient was found to have T wave inversions in V3-V6. Based upon his history, physical, and corrected diagnostic studies to determine the need for hospitalization to rule out acute coronary syndrome. Clinicians make important patient care decisions based upon electrocardiographic findings; therefore, clinicians must be aware of the potential pitfalls of incorrect lead placement in order to avoid potential mismanagement.

Electrocardiograms

Initial EKG: T wave inversions in V3-V6. Precordial leads placed from xiphoid process extending horizontally to the seventh intercostal space.

Second EKG: No T-wave inversions noted. Precordial leads placed in fourth and fifth intercostal spaces.

Discussion

A variety of individuals with varying levels of training perform EKGs on a regular basis in hospitals.

• In a study of cardiac technicians, nurses, and doctors, less than half of nurses and doctors correctly placed V1 in the 4th intercostal space. Most participants also placed V4, V5, and V6 following rib cage instead of in the same horizontal plane.1
• In a study of cardiac technicians, each precordial lead was an average of greater than one inch from the precise anatomically correct placement.3

Physicians, nurses, cardnicians, and any other employee involved in the acquisition of EKGs should undergo periodic retraining to help reduce the variability in lead placement.5

Variability in lead placement causing false positives can lead to two potentially harmful risks:

• Unnecessary invasive procedures
• Physicians discounting ischemic changes as artifacts

Correct Lead Placement of Precordial Leads. V1 at 4th intercostal space (IS) at right sternal border; V2 at IS at left sternal border; V3 midway between V2 & V4; V4 at 5th IS at midclavicular line; V5 midway between V4 and V6; V6 in horizontal plan of V4 at midaxillary line.

Conclusion

Chest pain prompts many emergency department visits requiring clinicians to risk stratify patients based upon history, physical, and initial diagnostic studies to determine the need for hospitalization to rule out acute coronary syndrome. Clinicians make important patient care decisions based upon electrocardiographic findings; therefore, clinicians must be aware of the potential pitfalls of incorrect lead placement in order to avoid potential mismanagement.

References