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International Journal of Cardiology 107 (2006) 369 – 375

International Journal of Cardiology

www.elsevier.com/locate/ijcard

The diagnostic value of troponin T testing in the community setting

David Planer[a,b,*,1], David Leibowitz[b,1], Ora Paltiel[c], Rina Boukhobza[b], Chaim Lotan[b], Teddy A. Weiss[b]

[a]*Department of Internal Medicine, Hadassah-Hebrew University Medical Center, Mount Scopus Campus, POB 24035, Jerusalem, Israel*
[b]*Department of Cardiology, Hadassah-Hebrew University Medical Center, Mount Scopus Campus, POB 24035, Jerusalem, Israel*
[c]*Braun School of Public Health and Community Medicine, Hadassah-Hebrew University Medical Center, Mount Scopus Campus, POB 24035, Jerusalem, Israel*

Received 23 January 2005; received in revised form 20 March 2005; accepted 26 March 2005
Available online 17 June 2005

Abstract

Background: Many patients presenting with chest pain to their family physician are referred to the emergency room, in part, due to lack of accurate objective diagnostic tools. This study aimed to assess the diagnostic value of bedside troponin T kit testing in patients presenting with chest pain to their family physician.
Design: Prospective, multi-center study.
Methods: Consecutive subjects with chest pain were recruited from 44 community clinics in Jerusalem. Following clinical assessment by the family physician, qualitative troponin kit testing was performed. Patients with a negative clinical assessment and negative troponin kit were sent home and all others were referred to the emergency room. The final diagnosis at the time of hospital discharge was recorded and telephone follow up was performed after 60 days. Positive predictive value, negative predictive value, sensitivity and specificity of troponin kit for myocardial infarction diagnosis and of family physician for hospitalization, were assessed.
Results: Of 392 patients enrolled, 349 (89%) were included in the final analysis. The prevalence of myocardial infarction was 1.7%. The positive and negative predictive values of the troponin kit for myocardial infarction diagnosis were 100% and 99.7%, respectively. The positive and negative predictive values of the family physician's assessment to predict hospitalization were 41.4% and 94.1%, respectively.
Conclusions: Troponin kit testing is an important tool to assist the family physician in the assessment of patients with chest pain in the community setting. Troponin kit testing may identify otherwise undiagnosed cases of myocardial infarctions, and reduce unnecessary referrals to the emergency room.

Keywords: Troponin; Chest pain; Myocardial infarction; Family physician

1. Introduction

Chest pain is a frequent complaint of patients, which presents an important diagnostic challenge to family physicians. While chest pain is frequently of non-cardiac origin, the possibility of life-threatening ischemia is difficult to exclude in the community setting [1,2]. Ischemic pain may be atypical, the physical examination is typically unrevealing, and electrocardiogram (ECG), when available, may not necessarily provide evidence of acute ischemia [3]. Studies of patients with chest pain in the emergency room have shown that over 2% of patients subsequently diagnosed with acute myocardial infarction were mistakenly discharged from the emergency room [4–6]. The diagnostic dilemma is particularly difficult when dealing with patients with prolonged chest pain, which has already subsided. Previous studies have mainly examined strategies for improving the diagnosis of acute coronary syndromes in the emergency room or the ambulance setting, with little data available to help the family

* Corresponding author. Internal Medicine Ward, Hadassah-Hebrew University Medical Center, Mount Scopus Campus, POB 24035, Jerusalem, Israel. Tel.: +972 2 5844111; fax: +972 2 5812754.
E-mail address: dplaner@md.huji.ac.il (D. Planer).
[1] The first 2 authors contributed equally to the study.

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doi:10.1016/j.ijcard.2005.03.054

physician [7–16]. The failure to diagnose acute ischemia may result in myocardial infarction or even sudden death, and expose the treating physician to litigation. Thus, many of patients with this complaint, even with low probability of acute ischemia, are referred to the emergency room for further evaluation, resulting in a high financial burden for the health care system as well as emotional distress for the patient and his family. Additional diagnostic tools for the family physician to assess patients with chest pain are necessary.

The development of troponin testing has increased the ability to detect even minor amounts of myocardial necrosis, and in fact, the definition of acute myocardial infarction is now based on the finding of elevated troponin levels [17]. Furthermore, elevated troponin levels define a high-risk group who will benefit from aggressive in-hospital treatment such as antiplatelet, antithrombotic and revascularization therapy [1,18–22]. Measurement of troponin levels in the emergency room has been studied and proven useful in patients presenting with acute chest pain and is now considered the gold standard for evaluation of the patient with a chest pain [23–27]. Recently, bedside kits for the measurement of troponin have become available with a reported sensitivity and specificity similar to laboratory analysis [1,28].

The objective of this study was to evaluate the diagnostic value of troponin T kit testing in the community setting for the assessment of patients presenting with chest pain.

2. Methods

2.1. Setting

Forty-four community clinics in Jerusalem participated in this trial. At the time of initiation of the study, family physicians in each individual clinic were instructed as to the inclusion criteria of the study and the use of the troponin kit test. Inclusion criteria for patients in the study were age >30 with at least 20 consecutive minutes of chest pain beginning at least 8 h prior to presentation and occurring within the previous six days. Patients with renal failure, ST elevation on ECG, and those diagnosed with acute coronary syndrome or who underwent revascularization within the two weeks prior to presentation—were excluded from the study.

The study protocol was approved by the institutional review board.

2.2. Patient evaluation by family physician

Written informed consent was obtained from consecutive patients who were eligible for the study.

The treating family physician subjectively assessed the possibility of acute ischemia as the cause of the patient's symptoms by history taking, risk factor analysis, physical examination and ECG. After this clinical assessment, the physician decided whether emergency room referral was necessary (ER+/−).

To ensure that the clinical assessment was not influenced by the troponin kit result, white and red coded and numbered kits were prepared. After clinical decision was made, the family physician opened a white or red kit for ER− or ER+ decision, respectively. Patients for whom both medical evaluation and troponin kit were negative were discharged; all other patients were referred for further evaluation to the emergency room. The patient's clinical evaluation form, envelope code and troponin kit result were sent by fax to the study coordinator.

2.3. Troponin T testing

Troponin kit testing was performed as reported previously on a whole-blood assay device (TROP T Sensitive, Boehringer Mannheim, Germany) [28]. In brief, a sample of venous blood was obtained and placed in K_2EDTA containing tube. From the tube, 0.15 mL of blood was drawn and placed on the test strip. Ten minutes later, qualitative results (+ or −) were reported by the kit. The test cut-off (90% of results positive) is 0.08 μg/L, and the detection limit is about 0.05 μg/L. The analytical specificity of the test is between 99.7% and 99.9% [28].

2.4. Patient referral and emergency room evaluation

The emergency room physician was unaware of the troponin kit results in the community clinic. Medical assessment and decision-making were performed according to the common practice accepted for evaluation of patients with chest pain. All emergency room and hospital ward records were reviewed by two experienced cardiologists (DL, ATW).

2.5. Follow up

All patients were followed up by phone two months after study entry for any cardiac events such as chest pain admission, myocardial infarction, revascularization, hospitalization and death.

2.6. Study endpoints

Primary endpoints of the study were sensitivity, specificity, positive and negative predictive values of troponin kit for the diagnosis of myocardial infarction within 72 h from presentation.

Secondary endpoints included prevalence of myocardial infarction in the study population, sensitivity, specificity, positive and negative predictive values of the family physician to predict hospitalization, and agreement between the primary physician in the community and the emergency room physician concerning hospitalization.