EDITORIAL

The significant challenge of chest pain in the emergency department

William J. Brady[1], Chris A. Ghaemmaghami[2]

[1]Professor and Vice Chair, Department of Emergency Medicine. Professor, Department of Medicine. University of Virginia Medical Center. Charlottesville, VA. USA. [2]Associate Professor and Program Director, Department of Emergency Medicine. Associated Professor, Department of Medicine. University of Virginia Medical Center. Charlottesville, VA. USA.

In this issue of Emergencias, two excellent scholarly investigations highlight the challenges of chest pain evaluation in the emergency department. The first paper, entitled "The characteristics and management of patients with non-traumatic chest pain in hospital emergency departments. The results of the EVICURE II study," García-Castrillo and colleagues describe this challenge in adult patients with atraumtic chest pain managed in the emergency department (ED)[1]. In this non-consecutive, convenience sample of ED chest pain patients (numbering 1440 persons enrolled at 25 different medical centres), many important points were noted; perhaps most importantly, this study notes that a significant portion of these chest pain patients demonstrate atypical ACS presentations, nondiagnostic 12-lead electrocardiograms (ECG), and/or uncomplicated ED courses -- the "obvious" ACS cases represented a minority of the patients reviewed. Other areas of import include the patient delay in seeking medical assistance as well as the delay in performing the initial ED ECG. All in all, this paper very appropriately describes the challenge for the emergency physician in the identification and management of the chest pain patient with ACS.

The second paper by Riesgo et al, "Diagnosis of thoracic pain in the emergency department: Are there differences between women and men?," expands on the first study by Garcia-Castrillo and colleagues with a review of gender-based differences in chest pain presentation and management among 4568 patients, again highlighting the challenges in acute coronary syndrome (ACS) detection -- in a general sense as well as a function of gender[2]. This investigation focused on ED patients entered into the study after a focused evaluation and ECG; in this subset of ED chest pain patients, 59% of patients were initially considered to have ACS (5% with ST segment elevation, 8% with ST segment depression, and 46% with non-diagnostic ECG). As with the Garcia-Castrillo study [1], the time to the initial ECG was not optimal in all groups. And, importantly, a gender difference was noted in various evaluation and management strategies; these gendered-based differences largely resolved when considered in light of the TIMI score.

Most disease states and syndromes in clinical medicine present across a spectrum of abnormality or severity; such is true of the chest pain patient suspected of ACS. As is apparent from both of these well performed studies, the identification of the "more severe" end of this spectrum – the ill ACS patient -- is usually straightforward, if not medically quite easy. Certain features in the history, initial diagnostic evaluation, or early ED course distinguish these higher risk patients from the remainder of individuals at less short-term risk. Numerous such examples exist, including the following scenarios: recurrent, concerning chest discomfort with past coronary artery disease; acute pulmonary edema; sustained, compromising hypotension temporally unrelated to vasodilator therapy; malignant dysrhythmias; clinically significant electrocardiographic abnormality; and markedly abnormal serum markers occurring within the appropriate clinical context. Within the context of ACS, these patients are frequently diagnosed with STEMI and NSTEMI with or without acute cardiovascular complication – clearly warranting hospital admission coupled with further cardiovascular evaluation and management.

Correspondence: E-mail: wjbrady@virginia.edu
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The more benign end of the chest pain clinical spectrum is usually easily identified after a focused ED evaluation. This group of patients has a markedly lower probability for ACS due to a variety of factors, such as atypical host age (i.e., quite young), unusual chest discomfort description, physical examination with obvious abnormality suggesting a non-ACS source of the pain, and normal or non-worrisome 12-lead ECG, to name only the most commonly evaluated features of the presentation. The clinician, of course, will not base his / her assessment on a single feature of the presentation; rather, these individual issues must be considered as "one small piece" of the larger diagnostic puzzle and evaluated as part of the entire picture. Such an approach not only illustrates the most appropriate use of clinical data in medical decision making but also considers the unpleasant fact that atypical ACS presentations – i.e., exceptions to these individual factors – are not uncommon in the clinical setting.

With identification of these two "rather obvious" chest pain subgroups, the emergency physician is left with the low to intermediate risk segment – in the two accompanying studies, this segment of the ED population accounted for approximately half of the patients evaluated[1,2]. Here, the emergency physician uses the history of the event, patient medical history, ECG, serum marker analysis, and ED course in this evaluation and further risk determination; at times in selected cases, additional diagnostic studies such as exercise stress testing or echocardiography are also employed. Unfortunately, the history, by itself, is not adequate in selecting the appropriate lower risk patient for additional outpatient management after the ED evaluation is unrevealing. Sanchis and colleagues [3] explored the value of the clinical history by itself in this evaluation, concluding that the clinical history itself is not a primary determinant of safe discharge. Schillinger et al[4] separated the event history into typical and atypical, noting that atypical historical features were associated with a lower rate of occurrence of both AMI and adverse outcome; in fact, increasingly atypical presentations demonstrated an inverse relationship with AMI or acute cardiovascular complication. Unfortunately, AMI was still encountered in a subgroup of this atypical population. Thus, the history is not a reliable indicator by itself in determining disposition.

The physical examination has limited value in the identification of ED chest pain patients who are appropriately released from the emergency department. Of course, findings such as hypotension, pulmonary edema, and malignant dysrhythmia are all reliable identifiers of higher risk individuals yet their absence does not convey a low risk status. The two primary diagnostic studies in this evaluation are the ECG and serum markers. The initial 12-lead ECG obtained in the ED can be a helpful guide for determination of cardiovascular risk and, as such, the choice of in-hospital admission location -- unfortunately, not unlike the history and physical examination, the absence of abnormality does not equal medical stability and therefore lower cardiovascular risk. For example, Brush et al[5] have classified initial ECGs into high- and low-risk groups. The low-risk electrocardiographic group had absolutely normal ECGs, nonspecific ST-T wave changes (NSSTTW), or no change when compared with a previous ECG. High-risk ECGs had significant abnormality or confounding pattern -- such as pathologic Q waves, ischemic ST segment or T-wave changes, left ventricular hypertrophy, left bundle branch block, or ventricular paced rhythm. Patients with initial ECGs classified as low risk have a 14% incidence of AMI, 0.6% incidence of life-threatening complications, and a 0% mortality rate[5]. Patients with initial ECGs classified as high risk have a 42% incidence of AMI; 14% life-threatening complications, and 10% mortality rate[5].

Serum marker analysis, primarily using the troponin assay, is an important diagnostic tool in the chest pain patient suspected of ACS. Ghaemmaghami and colleagues (personal communication) have suggested that negative serial troponin determinations, in the setting of a stable patient with a normal to near-normal ECG, are associated with an extremely low adverse event rate in adult chest pain patients who have competed the "rule out MI" ED evaluation. In fact, ED chest pain patients with undetectable circulating levels of cTnI have very low rates of ACS independent of other clinical variables. Ghaemmaghami has noted that, in a series of patients with undetectable circulating levels of serial troponin values, there were zero deaths or AMIs and a 1.8% rate of revascularization at 30 days from time of ED (personal communication).

The use of multiple variables simultaneously – i.e., the application of a clinical decision rule -- in this evaluation is a more appropriate approach to chest pain risk determination in the ED. Clinical decision rules have been developed to assist in this challenging process, utilizing various features of the ED evaluation. In just such an application, the Vancouver Chest Pain Rule[6] is focused on the identification of ED chest pain patients with a low

risk of acute coronary syndrome. In this population, the authors noted that patients with a normal ECG, without previous ischemic chest pain, and young age (less than 40 years) demonstrated a very low risk of acute coronary syndrome. Further, in patients over age 40 years who demonstrated a normal ECG, lacked previous ischemic chest pain, had low-risk pain characteristics, and negative serial biomarkers were also at low risk for ACS. This rule is certainly of value in the younger patient with a negative ED evaluation yet it is of less clinical significance in older patients or in those individuals with a past history of ischemic heart disease.

The Goldman criteria and the Thrombolysis in Myocardial Infarction (TIMI) risk score have been used for hospitalized patients in the determination of risk stratification. Limkakeng et al[7] combined the Goldman criteria with cardiac troponin analysis in an attempt to increase the rule set's ability to identify those low-risk patients appropriate for discharge. Unfortunately, the combination of the Goldman criteria with serum biomarkers in the ED chest pain patient did not identify a subgroup with less than 1% risk for AMI or poor outcome within 30 days. In a similar analysis, Chase et al[8] attempted to use the TIMI risk score to describe ED chest pain patients in a risk stratification sense. The investigators found that the TIMI risk score correlated with outcome; importantly, however, the tool did not separate patients into discrete risk groups, allowing for the identification of individuals appropriate for ED discharge. Thus, the TIMI risk score should not be used in isolation to determine disposition of ED chest pain patients.

Thus, the evaluation of the chest pain patient suspected of ACS is a significant challenge to the emergency physician as noted by the García-Castrillo and Riesgo investigations[1,2]. The appropriate selection of the low risk patient at the initiation of emergency department care followed by a negative ED evaluation can identify certain patients who can be safely discharged with short-term outpatient follow-up.

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