Significance of atypical symptoms for the diagnosis and management of myocardial infarction in elderly patients admitted to emergency departments

Impact des symptomatologies cliniques atypiques dans le diagnostic et la prise en charge de l’infarctus du myocarde des sujets âgés dans les services d’urgences

Pierre Grosmaitre\textsuperscript{a,}\textsuperscript{*}, Olivier Le Vavasseur\textsuperscript{b}, Estelle Yachouh\textsuperscript{c}, Yves Courtial\textsuperscript{d}, Xavier Jacob\textsuperscript{e}, Sylvie Meyran\textsuperscript{f}, Pierre Lantelme\textsuperscript{g}

\textsuperscript{a} Service de Gériatrie, Hôpital du Dr-Frédéric-Dugoujon, Groupement Hospitalier Nord, Hospices Civils de Lyon, Lyon, France
\textsuperscript{b} Service de Cardiologie, Hôpital Nord-Ouest, Gleizé, France
\textsuperscript{c} Service d’Accueil des Urgences, Hôpital de la Croix-Rousse, Groupement Hospitalier Nord, Hospices Civils de Lyon, Lyon, France
\textsuperscript{d} Service d’Accueil des Urgences, Hôpital Édouard-Herriot, Hospices Civils de Lyon, Lyon, France
\textsuperscript{e} Service d’Accueil des Urgences, Centre Hospitalier Lyon Sud, Hospices Civils de Lyon, Lyon, France
\textsuperscript{f} Service d’Accueil des Urgences, Centre Hospitalier Saint-Joseph Saint-Luc, Lyon, France
\textsuperscript{g} Fédération de Cardiologie, Hôpital de la Croix-Rousse, Groupement Hospitalier Nord, Hospices Civils de Lyon, Lyon, France

Received 23 October 2012; received in revised form 17 April 2013; accepted 25 April 2013
Available online 5 November 2013

Abbreviations: ACS, acute coronary syndromes; ECG, electrocardiogram; ED, emergency department; GRACE, Global Registry of Acute Coronary Events; NRMI, National Registry of Myocardial Infarction; SD, standard deviation; SEGA, Short Emergency Geriatric Assessment; STEMI, ST-segment elevation myocardial infarction.

\textsuperscript{*} Corresponding author. Service de Gériatrie, Hôpital Frédéric-Dugoujon, Hospices Civils de Lyon, 14, rue Pasteur, 69300 Caluire-et-Cuire, France.

E-mail addresses: pierre.grosmaitre@gmail.com, pierre.grosmaitre@chu-lyon.fr (P. Grosmaitre).

1875-2136/$ – see front matter © 2013 Elsevier Masson SAS. All rights reserved.
http://dx.doi.org/10.1016/j.acvd.2013.04.010

Atypical symptoms of myocardial infarction in elderly patients in the ED

Summary

Background. — Few recent studies have examined the characteristics of ST-segment elevation myocardial infarction (STEMI) among elderly patients managed in emergency departments (EDs).

Aims. — To describe the clinical characteristics and management of elderly STEMI patients in EDs.

Methods. — This retrospective, multicentre study involved STEMI patients aged ≥75 years admitted to four different EDs in the city of Lyon between 2004 and 2008.

Results. — Among 255 patients, reasons for admission to the ED included chest pain (41.2%), faintness and/or fall (15.7%), dyspnoea (15.7%), digestive symptoms (9.8%), impaired general condition (6.7%) and delirium (5.0%). Compared with those who presented with chest pain, patients admitted for other reasons waited longer before going to the hospital (prehospital delay < 12 hours: 32.0% vs 73.3%; \( P < 0.001 \)), presented with more severe clinical symptoms (Killip score ≥ III: 28.0% vs 10.5%; \( P = 0.001 \)), waited longer to be examined in the hospital (waiting time > 1 hour: 36.0% vs 11.4%; \( P < 0.001 \)), were less likely to receive reperfusion therapy (40.7% vs 77.1%; \( P < 0.001 \)) and had a higher mortality rate at 1 month (42.7% vs 21.0%; \( P < 0.001 \)).

Such atypical symptoms are more common among patients with cognitive impairment and/or communication difficulties.

Conclusion. — Atypical clinical symptoms of STEMI are common and severe among elderly patients in EDs. Thus, rapid provision of an electrocardiogram to all elderly patients admitted to the ED is essential, even in the absence of cardiovascular symptoms.

© 2013 Elsevier Masson SAS. All rights reserved.

Introduction

Owing to an aging population, myocardial infarction is affecting an increasing number of patients > 75 years old [1]. Myocardial infarction prognosis is particularly poor within this age range, with nearly half of hospital deaths associated with this disease affecting older people [2]. In ST-segment elevation myocardial infarction (STEMI), early reperfusion therapy significantly improves prognosis in terms of survival and quality of life, even in patients > 85 years old [3–7]. The speed with which these patients are initially managed is critical and determines their prognosis [8,9]. In emergency departments (EDs), early diagnosis of STEMI following admission is key to providing eligible patients with reperfusion therapy as soon as possible [10].

Chest pain is the most common presenting complaint that leads to suspicion of myocardial infarction in the ED, and to the completion of an electrocardiogram (ECG) soon after the patient’s arrival. However, among elderly patients, the positive predictive value of chest pain for myocardial
infarction diagnosis is low [11]. Moreover, the prevalence of atypical myocardial infarction clinical presentation, i.e. without chest pain, increases with age [12–15]. Patients with atypical clinical symptoms are at risk of delayed diagnosis, incorrect management and inappropriate discharge, and are less likely to receive reperfusion therapy [12,13,16]. Few studies have examined the specificities incurred by these clinical changes on the diagnosis and management of elderly patients with myocardial infarction in the ED. Therefore, the aims of this study were to describe the clinical presentation of elderly STEMI patients in EDs and evaluate their impact on patient management and outcome.

Methods

Study population

Patients aged ≥ 75 years successively admitted with a main diagnosis of STEMI were retrospectively included in the study. This population was identified between January 2004 and December 2008 via the computer databases of the four main EDs in the city of Lyon.

After identifying patients with a discharge diagnosis of acute coronary syndromes (ACS) during the period of the study, analysis of all files allowed patients with suspected STEMI to be selected. These patients’ medical records reported a systematic ST-segment elevation in an arterial territory, which the emergency physician suspected was an acute or subacute myocardial infarction. Patients with a pacemaker or left bundle branch block were considered as suspected STEMI only if the emergency physician considered it equivalent to STEMI. This suspicion of STEMI was confirmed in each case by an elevation of troponin. Only patients with confirmed STEMI were included, after exclusion of differential diagnoses made in cardiology and patients with missing data.

Data collection

Data collection was carried out using computerized patient records from the four EDs. The recorded reasons for admission were those mentioned by the triage nurses. Atypical presentations were those of patients not admitted to the ED for chest pain. If several reasons for admission were noted, including chest pain, only chest pain was considered. If several reasons were noted, but not including chest pain, only the main complaint for admission was considered.

Demographic data (age, gender, residence [home or nursing home]), clinical data related to STEMI (prehospital time delay, arterial territory, Killip score), medical history and chronic treatment information were collected from the ED records. The comorbidity scale of the Short Emergency Geriatric Assessment (SEGA) tool [17] was used to classify patients into three groups: (1) no pathology; (2) 1–3 diseases and (3) ≥ 3 diseases and/or history of stroke and/or chronic obstructive pulmonary disease and/or cardiac failure (i.e. polypathology). Diabetes was recorded if mentioned in the medical history and/or in cases of previous treatment with oral antidiabetic drugs or insulin.

Regarding patient management in the EDs, the waiting time was estimated based on the time to registration at the reception desk and the time to first medical contact (with a hospital intern or physician). Time taken for diagnosis and decision-making corresponded to the period of time between the first medical observation and that of the note in which the therapeutic strategy chosen was described for the first time. Patients whose impaired communication skills were explicitly mentioned during the collection of medical history (considered difficult or impossible) were identified.

Data regarding management in the cardiology departments were collected from the computerized files or paper records in case of missing data. Reperfusion therapy was defined as thrombolysis or therapeutic coronary angiography.

One-month mortality was determined for all patients via telephone calls by the physician or cardiologist, after exclusion of patients with a differential diagnosis following their cardiology check-up.

Statistical analysis

Quantitative variables are expressed as mean ± standard deviation (SD) and qualitative variables as counts and percentages. A χ² test was used to compare qualitative variables between the chest pain and atypical presentation groups, with an α risk of 0.05. Quantitative variables were compared using Student’s t-test. To identify predictive factors for death at 1 month, multivariable logistic regression was performed, which included all variables significantly associated with 1-month mortality in the univariate analysis. All statistical analyses were performed with XLSTAT 2011 (Addinsoft).

Results

A total of 853 patients with a discharge diagnosis of ACS were identified from January 2004 to December 2008. After exclusion of 572 patients with non-STEMI, 20 with differential diagnoses made in cardiology and six with missing data, 255 patients with confirmed STEMI were included (Fig. 1).
Atypical symptoms of myocardial infarction in elderly patients in the ED

Table 1 Main patient clinical characteristics according to the reasons for admission to the ED.

<table>
<thead>
<tr>
<th></th>
<th>Total population (n = 255)</th>
<th>Atypical presentation (n = 150)</th>
<th>Chest pain (n = 105)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>84.6 ± 6.1</td>
<td>85.1 ± 5.5</td>
<td>83.9 ± 4.8</td>
<td>0.105</td>
</tr>
<tr>
<td>Women</td>
<td>160 (62.7)</td>
<td>104 (69.3)</td>
<td>56 (53.3)</td>
<td>0.013</td>
</tr>
<tr>
<td>Residence in a nursing home</td>
<td>45 (17.6)</td>
<td>33 (22.0)</td>
<td>12 (11.4)</td>
<td>0.044</td>
</tr>
<tr>
<td><strong>Comorbidities/medical history</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polypathology</td>
<td>75 (29.4)</td>
<td>51 (34.0)</td>
<td>24 (22.9)</td>
<td>0.075</td>
</tr>
<tr>
<td>No history of CAD</td>
<td>202 (79.2)</td>
<td>120 (80.0)</td>
<td>82 (78.1)</td>
<td>0.832</td>
</tr>
<tr>
<td>Diabetes</td>
<td>36 (14.1)</td>
<td>18 (12.0)</td>
<td>18 (17.1)</td>
<td>0.328</td>
</tr>
<tr>
<td>Dementia</td>
<td>39 (15.3)</td>
<td>34 (22.7)</td>
<td>5 (4.8)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Clinical characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prehospital delay &gt; 12 hours</td>
<td>125 (49.0)</td>
<td>48 (32.0)</td>
<td>77 (73.3)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>ST elevation territory: anterior</td>
<td>122 (47.8)</td>
<td>76 (50.7)</td>
<td>46 (43.8)</td>
<td>0.341</td>
</tr>
<tr>
<td>Killip score ≥ III</td>
<td>53 (20.8)</td>
<td>42 (28.0)</td>
<td>11 (10.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Impaired communication skills</td>
<td>86 (33.7)</td>
<td>72 (48.0)</td>
<td>14 (13.3)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Data are mean ± standard deviation or number (%).
CAD: coronary artery disease; COPD: chronic obstructive pulmonary disease; ED: emergency department.

Figure 2. Atypical reasons for admission.

Chest pain was the main complaint that led to admission (n = 105; 41.2%), according to data recorded by the triage nurse. Atypical reasons accounted for 150 admissions (58.8%), and are shown in Fig. 2. Classical reasons for admission in geriatric patients, such as faintness and/or fall, impaired general condition and delirium and/or impaired vigilance accounted for more than a quarter of admissions (n = 70; 27.5%).

General and clinical characteristics are summarized in Table 1, overall and according to whether patients reported an atypical presentation or chest pain to the triage nurse. Patients with an atypical clinical presentation were more likely to reside in a nursing home and/or have dementia and/or impaired communication skills, suggesting that they were more vulnerable than those admitted with chest pain. Prehospital delays were also longer for atypical patients; only 32.0% of them arrived in time to potentially receive reperfusion therapy (<12 hours) compared with 73.3% of those admitted due to chest pain (Table 1).

The main management differences between patients with atypical presentation and those admitted for chest pain are presented in Table 2. Despite more severe clinical symptoms, the duration of emergency management, including waiting time, was longer for patients with atypical presentations. The type of clinical presentation appeared to be more closely correlated with management by reperfusion therapy than prehospital delay. Indeed, in cases of admission for chest pain, 77.1% of patients were treated with reperfusion therapy, regardless of prehospital delay. In contrast, patients with an atypical presentation were less likely to receive reperfusion therapy (40.7%), even if they were eligible in terms of delay (54.2% vs 79.2% in cases of chest pain).

Table 3 shows the patients’ management after leaving the ED and the type of reperfusion strategy for the whole population. One-month mortality was 33.7% (n = 86) and was higher in cases of atypical presentation (42.7% vs 21.0%; unadjusted odds ratio 2.81, 95% confidence interval 1.59–4.97; P < 0.001; Fig. 3). However, after adjusting for age, delay, Killip score, communication skills and therapeutic strategy, atypical presentation did not remain significantly associated with 1-month mortality.

Discussion

In the present study, the prevalence of atypical ED presentation among STEMI patients ≥ 75 years was particularly high (58.8%). These atypical clinical presentations seemed to be associated with a certain cognitive and functional fragility, and were thus more difficult to detect in the EDs. However, their identification is important because they often reveal
severe clinical cases of STEMI and are associated with high mortality.

The prevalence of atypical clinical presentations in this study was higher than that reported in the literature. According to data from the Global Registry of Acute Coronary Events (GRACE) [13] and the National Registry of Myocardial Infarction (NRMI)-2 [12], myocardial infarction without chest pain affects approximately 44% of patients aged >75 years. The higher prevalence of atypical presentations found in our study is probably due to the patient selection method, as we only included patients who were initially treated in the ED. Indeed, patients with typical coronary symptoms are usu-

Table 2 Management approaches according to the reasons for admission to the ED.

<table>
<thead>
<tr>
<th></th>
<th>Total population (n = 255)</th>
<th>Atypical presentation (n = 150)</th>
<th>Chest pain (n = 105)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management in the ED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting time &gt; 1 hour</td>
<td>66 (25.9)</td>
<td>54 (36.0)</td>
<td>12 (11.4)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Decision-making &gt; 1 hour</td>
<td>106 (41.6)</td>
<td>81 (54.0)</td>
<td>25 (23.8)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Treatment administered in the ED</td>
<td>197 (77.3)</td>
<td>116 (77.3)</td>
<td>81 (77.1)</td>
<td>0.908</td>
</tr>
<tr>
<td>Aspirin</td>
<td>96 (37.6)</td>
<td>48 (32.0)</td>
<td>48 (45.7)</td>
<td>0.036</td>
</tr>
<tr>
<td>Clopidogrel</td>
<td>151 (59.2)</td>
<td>87 (58.0)</td>
<td>64 (61.0)</td>
<td>0.732</td>
</tr>
<tr>
<td>Low-molecular-weight heparin</td>
<td>29 (11.4)</td>
<td>16 (10.7)</td>
<td>13 (12.4)</td>
<td>0.823</td>
</tr>
<tr>
<td>Thrombolysis</td>
<td>13 (5.1)</td>
<td>3 (2.6)</td>
<td>10 (9.5)</td>
<td>0.016</td>
</tr>
<tr>
<td>Analgesic</td>
<td>63 (24.7)</td>
<td>30 (20.0)</td>
<td>33 (31.4)</td>
<td>0.053</td>
</tr>
<tr>
<td>Orientation at discharge</td>
<td>192 (75.3)</td>
<td>98 (65.3)</td>
<td>94 (89.5)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Referred to cardiology department</td>
<td>142 (55.7)</td>
<td>61 (40.7)</td>
<td>81 (77.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Prehospital delay &lt; 12 hours&lt;sup&gt;a&lt;/sup&gt;</td>
<td>87 (69.6)</td>
<td>26 (54.2)</td>
<td>61 (79.2)</td>
<td>0.006</td>
</tr>
<tr>
<td>Prehospital delay &gt; 12 hours or unknown&lt;br&gt;&lt;sup&gt;b&lt;/sup&gt;</td>
<td>55 (42.3)</td>
<td>35 (34.3)</td>
<td>20 (71.4)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Data are number (%).
ED: emergency department.
<sup>a</sup> Percentages are those with reperfusion therapy out of patients with prehospital delay < 12 hours.
<sup>b</sup> Percentages are those with reperfusion therapy out of patients with prehospital delay > 12 hours or unknown.

Table 3 Patient management and therapeutic strategy.

<table>
<thead>
<tr>
<th></th>
<th>Total population (n = 255)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposition at discharge</td>
<td></td>
</tr>
<tr>
<td>Cardiology</td>
<td>192 (75.3)</td>
</tr>
<tr>
<td>Post-emergency geriatrics</td>
<td>52 (20.4)</td>
</tr>
<tr>
<td>Death in the ED</td>
<td>10 (3.9)</td>
</tr>
<tr>
<td>Non-cardiac intensive care unit</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Reperfusion therapy&lt;sup&gt;a&lt;/sup&gt;</td>
<td>142 (55.7)</td>
</tr>
<tr>
<td>Coronary angiography</td>
<td>127 (49.8)</td>
</tr>
<tr>
<td>Attempted angioplasty</td>
<td>117 (45.9)</td>
</tr>
<tr>
<td>Successful angioplasty</td>
<td>13 (5.1)</td>
</tr>
<tr>
<td>Coronary artery bypass</td>
<td>2 (0.8)</td>
</tr>
</tbody>
</table>

Data are number (%).
<sup>a</sup> Coronary angiography and/or angioplasty and/or thrombolysis and/or bypass.

Figure 3. Mortality rate at 1 month according to clinical presentation.

... ally examined in a prehospital mobile emergency unit and admitted directly to the coronary angiography unit, without passing through the ED. In France, only 29–52% of STEMI patients of all ages are initially managed in the ED [18,19]. In the ESTIM-Rhône-Alpes regional observational registry, carried out between December 2003 and November 2006, 74.0% (n = 179) of STEMI patients > 75 years who were included were directly admitted to the interventional cardiology department (unpublished data). The population included in this registry is different from ours, as demonstrated by the mean age of participants, which was 80 years in the ESTIM registry compared to almost 85 years in our study. Also, the majority of patients included in the ESTIM registry had typical STEMI with chest pain. Thus, our study population is not representative of all STEMI patients. This could also explain the particularly long prehospital delays that we observed:
Atypical symptoms of myocardial infarction in elderly patients in the ED

51.0% of patients were admitted >12 hours after the onset of symptoms (or unknown delay), compared with 12.0% of patients ≥80 years of age in the NRMI [20]. Atypical clinical presentation of myocardial infarction has been found to be an important risk factor for longer prehospital delays [21].

Nevertheless, the clinical characteristics and management of patients with atypical clinical presentation in our study were similar to those observed in the literature. Based on data from the NRMI-2, Canto et al. have shown that patients hospitalized for myocardial infarction without chest pain had longer prehospital delays, more severe clinical symptoms, delayed care, higher hospital mortality and were less likely to receive revascularization therapy [21]. However, according to NRMI-2, atypical presentation was one of the most significant independent predictors associated with mortality [12]. Conversely, in our study, after adjusting for age, delay, Killip score, communication skills and therapeutic strategy, atypical presentation did not remain significantly associated with 1-month mortality. This discrepancy could be because the direct impact of atypical clinical presentation on mortality is more difficult to assess in our study because a standardized comorbidity scale was not used. Also, in our study, which focuses on older patients, it seems that atypical presentation is an integrative variable of several unfavourable factors, such as functional and cognitive impairment, polyopathy, longer prehospital delay, longer waiting time in the ED, higher Killip score and less reperfusion therapy.

In our study population, patients with an atypical presentation appeared to be more vulnerable, i.e. they more often resided in a nursing home, more often presented with dementia and in almost half of the cases, were difficult to interview by the emergency physician. It is possible that a large number of these patients were confused. In elderly patients, communication skills may be chronically affected by neurodegenerative diseases, neurovascular sequelae and sensory deficits, or they may be acutely affected, as is the case in delirium. Our study methodology did not allow us to make a distinction between these different and often intertwined causes. Myocardial infarction is a common cause of confusion in the elderly [22]. In EDs, impaired higher functions related to dementia and/or delirium are detected in 25% of patients aged >75 years [23]. These alterations can decrease the accuracy of diagnosis of the main complaint and mask potentially serious somatic diseases [24,25]. In our study, the correlation between atypical symptomatology and impaired communication skills supports this hypothesis. This underlines the importance of a rigorous diagnostic approach, including the completion of an ECG when an elderly patient with poor or no communication skills is admitted to the ED. This first-line examination is also recommended in cases of acute delirium [22,26]. Finally, it is critical to distinguish acute delirium from dementia, because the former, but not the latter, is potentially reversible through treatment of the trigger cause [22].

The diversity of admitting complaints that revealed STEMI in this study highlights the difficulty in detecting ACS in elderly patients in the ED. Chest pain is usually the main symptom. However, in the elderly, it has been shown that this symptom lacks specificity for predicting coronary emergencies [11]. NRMI-2 data have shown that age is the third most important risk factor for atypical presentation, following history of heart failure or stroke, but ahead of diabetes [12]. The initial assessment of classic geriatric syndromes that lead to admission to EDs, such as falls, impaired general condition and delirium, should systematically include an ECG.

The retrospective nature of the study and its implementation in only one French city limits the possible generalization of the results. In addition, the methodology did not allow the use of standardized scales (such as the Mini Mental State Examination, the Confusion Assessment Method, the Activities of Daily Life scale and the Instrumental Activities of Daily Life scales) to assess the cognitive and functional status of patients, and thus, its impact on symptoms, as well as on patient management, could not be accurately determined. This lack of a standardized scale of comorbidities prevents a reliable analysis of prognostic factors for mortality. Finally, specifically targeting STEMI is questionable, because its incidence decreases with age and it represents only 30% of all elderly subjects with ACS [15]. However, if atypical clinical signs are common among elderly STEMI patients referred to the ED, this should also be the case for non-STEMI patients, who more often present with atypical clinical presentations than STEMI patients in the general population [12,13,15].

Conclusions

Atypical clinical presentations of STEMI in the ED are very common and often severe among elderly patients. They appear to be associated with vulnerability criteria, such as dementia, functional dependence and impaired communication skills. Conversely, the presence of chest pain seems to indicate a better prognosis and outcome, with shorter prehospital times, higher rates of reperfusion therapies and higher survival rates at 1 month. The rapid completion of an ECG for any elderly patient visiting the ED is essential, even in the absence of cardiovascular symptoms.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgments

The authors wish to especially thank Pr. Krolak-Salmon for his review of the manuscript and advice.

References


