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ORIGINAL ARTICLE

Chest pain and acute coronary syndrome in octogenarians admitted to the Emergency Department

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Abstract

Background Although chest pain and acute coronary syndrome (ACS) are among the most common complaints in the Emergency Departments (ED), little is known about this topic in the octogenarian population.

Objectives This study aimed to describe the clinical presentation and to evaluate survival time according to the ACS type in a group of 80-year-old or over patients admitted for chest pain to an ED.

Methods Patients were classified according to the discharge diagnosis. A multivariable Cox regression analysis was done to assess the association between ACS type and mortality with the non-ACS chest pain group as the reference category.

Results ACS was diagnosed in 170 of the 391 patients analyzed and 51% of ACS patients were female. Within the ACS patients, 18.8% presented STEMI, 57% NSTEMI, and 24% unstable angina (UA). Most of the patients were treated conservatively. In the adjusted analysis, the incidence of death at 40 months of follow-up was higher in patients with STEMI (HR 3.24; CI 1.59–6.56) than NSTEMI (HR 2.53; CI 1.56–4.11). There was no difference between patients with UA and the non-ACS group (HR 0.64; CI 0.26–1.58), and myocardial revascularization was associated with reduced mortality risk (HR 0.45; CI 0.22–0.92).

Conclusions A high prevalence of ACS was found among octogenarians admitted to the ED with chest pain, and the ACS type behaved as an independent predictor of mortality. Patients with UA diagnosis had a similar prognosis to patients with non-ACS chest pain, but this needs to be demonstrated by a prospective study.

Keywords Acute coronary syndrome · Chest pain · Myocardial infarction · Octogenarians · Mortality

Introduction

Coronary arterial disease (CAD) incidence increases proportionally to age [1], and chest pain is a common presenting complaint in Emergency Departments (EDs). As such, an increase in the number of geriatric patients with acute coronary syndrome (ACS) in EDs is expected [2]. Diagnosing ACS in elderly patients with chest pain is a difficult task because they may not present with pathognomonic symptoms [3, 4], leading to a late diagnosis with a greater possibility of adverse outcomes [5].

Conversely, age is one of the most important predictors of mortality in patients with ACS [6]: elderly patients frequently have a greater number of comorbidities and a lower probability of receiving reperfusion therapy [7, 8]. Additionally, complications such as reinfarction, heart failure, cerebrovascular accident, kidney failure, and bleeding are more frequent in this population [9]. In geriatric patients, antithrombotic overdosing is a frequent event [10], and many of them are contraindicated for evidence-based treatments. In a study that included nonagenarians with non-ST segment elevation (NSTE)-ACS, 10–15% had contraindications for aspirin, beta-blockers, and statins, and up to 20% had contraindications for angiotensin-converting enzyme (ACE) inhibitors [9].

Despite the importance of this situation, octogenarians are poorly represented in clinical trials [11], and due to a

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selection bias, the included population may not represent this age group very well [12]. Likewise, the representation of this population in clinical trials such as the TRITON-TIMI 38 was only 13% [13], and 15% in the PLATO trial [14]. Although some studies have tried to address this problem [15], the frequency of ACS in octogenarian patients with chest pain from suspect cardiac etiology in EDs is unknown. There are also no studies that address the prognosis in terms of survival according to the ACS type in a geriatric population over 80 years old. Given all these reasons and the lack of available information, the goal of this study was to describe the clinical presentation and to evaluate survival time according to the ACS type in a group of octogenarians admitted for chest pain to an ED.

Materials and methods

Type of study

A retrospective cohort study was conducted at the Auna Clínica Las Américas, a high-complexity cardiovascular reference center in Medellín, Colombia. This center has recognized experience in the care of patients with cardiovascular diseases and has a well-structured emergency department and a 17-bed coronary care unit. The study protocol was classified as a risk-free investigation and approved by the institutional Research Ethics Committee.

Population and definitions

All patients aged 80 or over admitted to the ED for chest pain and suspected of ACS from January 1, 2016, to December 31, 2016, were included. Symptoms considered suggestive of SCA included chest pain described as discomfort, heaviness, tightness, pressure, burning, numbness, fullness, or tightness in the chest. Other symptoms considered suggestive of myocardial ischemia included pain or discomfort in the arms, neck, jaw or epigastrium. Patients who did not have an electrocardiogram (ECG) or a cardiac troponin (cTn) measured were excluded. The patients were classified according to the discharge diagnosis into four groups: ST segment elevation myocardial infarction (STEMI), non-ST segment elevation myocardial infarction (NSTEMI), unstable angina (UA), and non-ACS chest pain. The cases with doubts about the final diagnosis were reviewed by a second clinical cardiologist who was not part of the study. STEMI was definite by an ST elevation at the J point in two anatomically contiguous leads (1 mm in all leads other than V2–V3 where the diagnostic thresholds applied were $\geq$ 2 mm in men or 01.5 mm in women). NSTEMI was definite by non-ST elevation in ECG with at least one high-sensitivity troponin I (hs-cTnI) result > P99 (percentile 99th) in a patient with symptoms suggestive of cardiac ischemic. UA was considered in patients with symptoms suggestive of ACS and hs-cTnI result < P99. All hs-cTnI measurements were made with ARCHITEC® (Abbott Laboratories), which has a P99 threshold defined as 16 ng/L in females and 34 ng/L in males, and an LD (limit of detection) 2 ng/L. At the institution where the study was carried out, an algorithm is used at the diagnostic of acute myocardial infarction (AMI) in the ED. According to the algorithm, if the first hs-cTnI result is below the LD, the AMI diagnosis is ruled out, and when the first hs-cTnI result is between LD and P99, a second measurement is required.

Data recollection

Information about demographic characteristics, comorbidities, and clinical variables was obtained from medical records through a case report form (CRF), which was reviewed by the investigators and transferred to a database designed specifically for the study. The data on vital status and date of death were obtained directly from a national record (Registraduría Nacional del Estado Civil de Colombia).

Statistical analyses

Distributions of quantitative variables were described as means ($\pm$ SD) or by the median and interquartile range (IQR) according to the assumption or not of the normality and compared by using the *T* test, Mann–Whitney *U* test or Kruskal–Wallis test as appropriate. Qualitative variables were summarized by count and percentage and compared with the use of the Chi-square test or Fisher's exact test when necessary. For survival analysis differences in time-to-event, distributions were evaluated employing the log-rank test. A hazard estimator with a 95% confidence interval (CI) was calculated through a Cox regression. For Cox regression analyses, the exposure of interest was the ACS type, and the primary outcome was time to death. To provide adjusted measures of association between ACS type and mortality, the statistically significant variables in the univariable analysis, and other biological plausible confounders were included in the multivariable analysis. The proportional hazards assumption was tested through log–log curves and the Schoenfeld residual test. Data were managed with the Stata statistical package, version 14.2, and a two-sided *p* value of less than 0.05 was considered indicative of statistical significance.

Results

During the study period, 2968 adult subjects were admitted to the ED for chest pain and suspected cardiac ischemia; ACS was diagnosed in 820 of them (27.6%). In total, 391

(13.2%) subjects aged 80 years or older had a 12-lead ECG and at least one hs-cTnI measurement, and were included in this analysis. ACS was diagnosed in 170 (43.5%) of these patients and ruled out in 221 of them (non-ACS chest pain group). A second hs-cTnI measurement was taken in 90 (40.7%) of the non-ACS patients, transthoracic echocardiography in 136 (61.5%) and cardiac stress testing in 31 (14%) cases. Other tests for the study of chest pain in non-ACS patients included X-rays, tomography, ultrasound, and blood tests as was necessary. The most frequent discharge diagnoses among non-ACS patients were hypertensive crisis (25.8%), atrial fibrillation/flutter (13%), acid peptic disease (6.3%), and other multiple diseases such as heart failure, pneumonia, pulmonary embolism, sinus dysfunction, abdominal pain, muscle pain, chondritis, cholelithiasis, and sepsis; each one represented < 5% of cases.

Fifty-one percent of the ACS patients were female ($n = 87$), and the distribution of ACS patients was as follows: 32 presented as STEMI (18.8%), 97 NSTEMI (57%), and 41 corresponded to unstable angina (24%). Table 1 shows the characteristics of the patients classified according to ACS and non-ACS status. In general, a higher proportion of patients were female in STEMI (56%), NSTEMI (62.9%), and the non-ACS group (70.6%). No differences were observed in the median age between groups. Former or current cigarette smoking was more frequent in ACS patients compared with non-ACS patients. Similarly, previous dyslipidemia and chronic kidney disease (CKD) were more frequent in the ACS groups, while a history of MI and previous revascularization were more frequent in unstable angina (UA) patients (60.9% and 58%, respectively). The median time from symptom onset to admission was similar in patients with STEMI, UA, and non-ACS compared with the NSTEMI group which had double the time of the other groups (Table 2).

Table 1 Characteristics of patients according to acute coronary syndrome diagnosis

Characteristics	Acute coronary syndrome			Non-ACS chest pain ($N = 221$)
	STEMI ($N = 32$)	NSTEMI ($N = 97$)	UA ($N = 41$)	
Age—yr				
Median	84	84	84	84
Interquartile range	81–88	81–87	83–86	82–87
Sex—no. (%)				
Male	14 (44)	36 (37)	33 (80)	65 (29)
Female	18 (56)	61 (63)	8 (19)	156 (71)
Body mass index				
Median	26	24	25	25
Interquartile range	22–28	22–27	23–27	22–29
Cigarette smoking—no./total no. (%)				
Never smoked	13/32 (41)	53/96 (55)	16/40 (40)	142/218 (65)
Former smoker	14/32 (44)	34/96 (35)	19/40 (47)	58/218 (27)
Current smoker	5/32 (16)	9/96 (9)	5/40 (12)	18/218 (8)
Hypertension—no. (%)	30 (94)	94 (97)	40 (98)	205 (93)
Diabetes—no. (%)	13 (41)	40 (41)	18 (44)	72 (33)
Dyslipidemia—no. (%)	23 (72)	73 (75)	31 (76)	126 (57)
Chronic renal disease history—no. (%)	10 (31)	39 (40)	16 (39)	34 (15)
Estimated GFR—ml/min/1.73 m^2				
Median	43	39	39	42
Interquartile range	35–55	29–53	34–50	32–56
GFR < 30 ml/min—no./total no. (%)	6 (19)	32 (33)	9 (22)	34 (15)
Previous myocardial infarction—no. (%)	10 (31)	47 (48)	25 (61)	71 (32)
Previous CABG/PCI—no. (%)	8 (25)	31 (32)	24 (58)	60 (27)
Heart failure history—no. (%)	5 (16)	20 (21)	9 (22)	25 (11)
Previous stroke—no. (%)	1 (3)	8 (8)	2 (5)	13 (6)
Peripheral artery disease—no. (%)	2 (6)	12 (12)	2 (5)	19 (9)

ACS acute coronary syndrome, *CABG* coronary artery bypass graft surgery, *GFR* glomerular filtration rate, *NSTEMI* non-ST elevation myocardial infarction, *PCI* percutaneous coronary intervention, *STEMI* ST elevation myocardial infarction, *UA* unstable angina

Invasive strategy

Only 60 of the 170 patients with ACS (35%) underwent coronary angiography. The most frequent reasons for not doing coronarography were older age, individual criteria of the cardiologist, and in some cases, a stress echocardiography result. The mean age of patients undergoing angiography was 82.7 ± 4.5 years compared to 85.9 ± 2.7 years in patients in conservative strategy (p value < 0.001). Within the invasive strategy group, there was a higher proportion of STEMI diagnosis and a lower proportion of kidney failure and heart failure (Fig. 1). Percutaneous coronary intervention (PCI) was performed on 39 (65%) patients undergoing to coronarography and coronary artery bypass graft (CABG) on 4

Table 2 Clinical presentation, results of electrocardiogram, troponin and echocardiography

Characteristic	Acute coronary syndrome			Non-ACS chest pain (N = 221)	p value
	STEMI (N = 32)	NSTEMI (N = 97)	UA (N = 41)		
*Time from symptom onset to FMC—hours					0.022
Median	11	22	9	10	
Interquartile range	4–25	7–28	3–24	4–24	
†Chest pain characteristics—no./total no. (%)					< 0.001
Typical	24/30 (80)	53/83 (64)	7/31 (23)	31/157 (20)	
Atypical	5/30 (17)	27/83 (32)	13/31 (42)	123/157 (78)	
Anginal equivalent	1/30 (3)	3/83 (4)	11/31 (36)	3/157 (2)	
Heart rate—beats/min					0.001
Median	79	80	70	75	
Interquartile range	73–88	71–90	60–78	65–82	
Systolic blood pressure—mm Hg					0.808
Median	139	135	140	137	
Interquartile range	112–146	120–158	124–152	120–154	
Diastolic blood pressure—mm Hg					0.894
Median	74	70	72	70	
Interquartile range	62–80	63–79	63–80	60–80	
Electrocardiogram on admission—no. (%)					< 0.001
Normal	0	35 (36)	28 (68)	130 (59)	
ST depression, T wave changes or Q wave	0	32 (32)	7 (17)	21 (9)	
Other (arrhythmias, blocks)	0	30 (31)	6 (15)	70 (32)	
High-sensitive troponin I on admission					
Positive (> P99)—no. (%)	31 (97)	93 (96)	2 (5)	55 (25)	< 0.001
Result (ng/L)					0.001
Median	3299	539	9	8	
Interquartile range	432–29,050	115–2056	7–16	4–20	
Echocardiography					
Left ventricular ejection fraction (%)					0.001
Median	46	55	55	60	
Interquartile range	35–54	40–60	50–60	55–60	
Alterations segmental contractility—no. (%)	25 (78)	38 (44)	16 (53)	33 (24)	< 0.001
Diastolic disfunction—no. (%)	7 (22)	15 (17)	4 (13)	20 (15)	0.637
Hospitalization length stay—median ††IQR	7 (4–12)	5 (4–8)	2 (1–5)	1 (0–4)	0.001
Hospitality mortality—no. (%)	1 (3)	6 (6)	0	6 (3)	0.249

ACS Acute coronary syndrome, *NSTEMI* Non-ST elevation myocardial infarction, *STEMI* ST elevation myocardial infarction, *UA* unstable angina

**FMC* first medical contact

†Chest pain was defined as typical when it appeared with sudden, severe, and prolonged anginal pain with radiating to the jaw, dorsal region or upper limbs. Atypical chest pain was considered when characteristics of chest pain were different from those mentioned above and anginal equivalent was defined in the case of syncope, epigastric pain, or dyspnea

††IQR = interquartile range

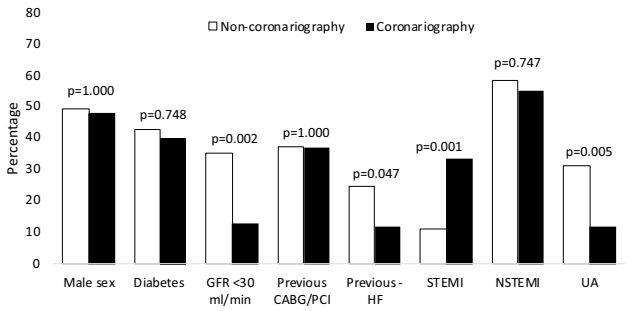

Fig. 1 Comparison of patients with ACS according to coronary angiographic realization. *CABG* coronary artery bypass graft surgery, *GFR* glomerular filtration rate, *HF* heart failure, *NSTEMI* non-ST elevation myocardial infarction, *PCI* percutaneous coronary intervention, *STEMI* ST elevation myocardial infarction, *UA* unstable angina

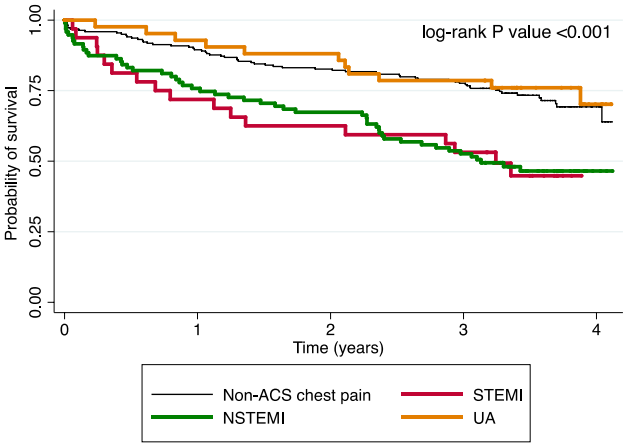

Fig. 2 Incidence of death according to ACS and non-ACS chest pain category (Kaplan–Meier estimator)

(7%) patients. Nonrevascularizable CAD was found in ten (16.7%) and coronary arteries without obstructive lesions in seven (11.7%) of the subjects.

Survival analysis

To assess the effect of ACS in octogenarians' survival, mortality from any cause was evaluated after a median follow-up of 40 months (IQR 27.7 to 45), using the type of ACS (STEMI, NSTEMI, or UA) as the main exposure. Figure 2 shows the estimations of the incidence of death over time, according to the Kaplan–Meier method. The greatest incidence of death occurred in STEMI and NSTEMI groups and the lowest incidence in the UA group. The differences were statistically significant (log-rank test p value < 0.001). Table 3 shows the results of the univariate and multivariate analyses. For this analysis, the ACS type was defined like STEMI, NSTEMI, and UA using the non-ACS chest pain group as a reference category as was explained in "Materials and methods". In the univariate analysis, a gradient association was found between the ACS type and the mortality risk. Taking the non-ACS as the reference category, no difference was observed with the UA group, while the NSTEMI and STEMI groups had a higher risk. A significant association was also found between risk of death and variable age (HR 1.07; 95% CI 1.03–1.11), glomerular filtration rate (GFR) (HR 0.98; 95% CI 0.97–0.99), and left ventricular ejection fraction (LVEF) (HR 0.97; 95% CI 0.95–0.98). Current myocardial revascularization showed no significant trend towards a decreased risk of death in the univariate analysis (HR 0.81; 95% CI 0.46–1.43), but this association became statistically significant in the multivariate analysis (HR 0.45; 95% CI 0.22–0.92).

To evaluate the independent effect of ACS type on mortality, we carried out an analysis adjusted for variables that showed a significant association in the univariate analysis [age, GFR and LVEF]. Because of their plausible association with the outcome, the variable diabetes and myocardial revascularization were also included in the multivariate model (Table 3). In the adjusted estimation, the gradient between the ACS type and the risk of death was maintained even after adjusting for the covariate. Table 4 shows the incidence rate of death and adjusted hazard ratio estimation according to ACS type. No difference was observed between the UA and the non-ACS group (HR 0.64; 95% CI 0.26–1.58). Patients in the NSTEMI group had an increased risk of death (HR 2.53; 95% CI 1.56–4.11) and the STEMI group had a higher risk of mortality (HR 3.24; 95% CI 1.59–6.56). For multivariate analysis, the proportional hazard assumption was verified (Schoenfeld residual test with a p value of 0.670 for the complete model).

Discussion

In this cohort of octogenarians admitted to the ED for chest pain and suspected of cardiac ischemia, ACS was diagnosed in 43.5% of the patients. The type of ACS behaved as an independent predictor of mortality, with STEMI and NSTEMI diagnoses being independent predictors of mortality at 40 months of follow-up. Patients with UA had a similar prognosis to those with non-ACS chest pain and that behavior persisted even after the adjustment for age, sex, diabetes, GFR, LEVF, and myocardial revascularization.

Although other studies have evaluated geriatric chest pain patients in the ED [15], this is the first study to present the prevalence, ACS type, and survival prognosis in an octogenarians cohort with chest pain suspected of myocardial ischemia and admitted to the ED. We observed a high proportion of ACS diagnosis with a high number of women in the STEMI, NSTEMI and non-ACS chest pain groups. This contrasts with previous publications in which a low

Table 3 Univariate and multivariate analysis for time to death

Variable	Univariate estimation		Multivariate estimation	
	Hazard ratio (95% CI)	*P* value	Hazard ratio (95% CI)	*P* value
ACS type (reference category non-ACS chest pain)				
Unstable angina	0.89 (0.47–1.69)	0.729	0.64 (0.26–1.58)	0.336
NSTEMI	2.24 (1.55–3.24)	0.000	2.53 (1.56–4.11)	< 0.001
STEMI	2.35 (1.37–4.02)	0.002	3.24 (1.59–6.56)	0.001
Age—years	1.07 (1.03–1.11)	< 0.001	1.04 (0.99–1.09)	0.085
Sex male	0.94 (0.67–1.32)	1.320	0.74 (0.49–1.11)	0.150
Cigarette smoking	0.99 (9.71–1.39)	0.996		
Hypertension	1.54 (0.65–3.89)	0.305		
Diabetes	1.36 (0.98–1.90)	0.067	1.46 (0.98–2.19)	0.063
Dyslipidemia	1.00 (0.71–1.42)	0.989		
Previous stroke	1.38 (0.75–2.56)	0.300		
Previous myocardial infarction	1.17 (0.84–1.63)	0.344		
Previous CABG/PCI	1.01 (0.85–1.21)	0.870		
Obesity (body-mass index > 30)	0.71 (0.41–1.22)	0.214		
Glomerular filtration rate (ml/min)	0.98 (0.97–0.99)	0.004	0.99 (0.97 – 1.01)	0.205
Left ventricular ejection fraction	0.97 (0.95–0.98)	< 0.001	0.98 (0.96–0.99)	0.010
Current myocardial revascularization	0.81 (0.46–1.43)	0.473	0.45 (0.22–0.92)	0.028

ACS Acute coronary syndrome, *CABG* Coronary artery bypass graft surgery, *NSTEMI* Non-ST elevation myocardial, *PCI* Percutaneous coronary intervention, *STEMI* ST elevation myocardial infarction, infarction

Table 4 Incidence rate and risk estimation for death of any cause (reference category non–ACS chest pain)

sACS type	Death no./total no. (%)	Events/100 patient-yr	Crude estimation		Adjusted estimation*	
			HR (95% CI)	*p*	HR (95% CI)	*p*
Non-ACS chest pain	64/221 (28.9)	9.53	1		1	
Unstable angina	11/41 (26.8)	8.53	0.89 (0.47–1.69)	0.729	0.64 (0.26–1.58)	0.336
NSTEMI	51/97 (52.6)	21.7	2.24 (1.55–3.24)	0.000	2.53 (1.56 –4.11)	< 0.001
STEMI	17/32 (53.6)	22.9	2.35 (1.37–4.02)	0.002	3.24 (1.59–6.56)	0.001

ACS Acute coronary syndrome, *HR* hazard ratio, *NSTEMI* Non-ST elevation myocardial infarction, *STEMI* = ST elevation myocardial infarction

*Adjusted HR for age, sex, diabetes, glomerular filtration rate (ml/min), left ventricular ejection fraction and current myocardial revascularization

proportion of women with STEMI has been observed in the general population [11, 16–23]. Other studies that have exclusively included the elderly have also found a higher proportion of men [7, 8, 24–27]. However, in large cohorts of octogenarians, the female sex was predominant in those with AMI [9, 12, 28–30], a biologically plausible finding due to the tendency in women to present ACS at an older age [31]. Similar to other studies [9, 28–30], factors such as smoking, dyslipidemia, and CKD behaved as frequent risk markers in geriatric people with ACS compared to those with non-ACS chest pain. Strikingly, we observed a median time from the onset of pain to the first medical contact (FMC) of almost 22 h in patients with NSTEMI compared to a time of between 9 and 11 h in the other groups. Another publication has also reported a prolonged time to FMC in elderly patients [7].

The type of ACS behaved as an independent predictor of mortality in octogenarian patients, with STEMI and NSTEMI diagnoses being independent predictors of mortality in the medium term, just as has been found in previous studies [8, 9, 11, 12, 25, 27, 29, 32–34]. Although the myocardial revascularization seemed to decrease the risk of death in the multivariate analysis, these results are not interpretable because most of the patients received conservative treatment, and the patients in invasive strategy were carefully selected. It has been found in different studies that geriatric patients are less likely to undergo an invasive strategy [8, 9, 11, 12, 27, 29, 32–35], and it should be remembered that the benefits of routine revascularization in octogenarians are controversial. While some studies support a reduction in mortality [8, 24, 27, 32, 36, 37], others have found no benefits [38, 39] and the follow-up of studies that

have tested the invasive strategy in the elderly population has varied between 6 months [27, 36] and 1 year [24], so the real impact of long-term revascularization in this age group remains unknown. Based on our results, we consider that the treatment strategy in octogenarians with ACS should be individualized. Due to the complexity of caring for this age group, it is necessary to consider, in addition to biological age, aspects such as cognitive and functional compromise, as well as the fragility of the patient [12, 40–42].

The most remarkable finding of our research was that after 40 months of follow-up, patients aged 80 years or older with UA had a similar prognosis to those with non-ACS chest pain and that behavior persisted even after the adjustment for age, sex, diabetes, GFR, LEVF, and myocardial revascularization. This counterintuitive finding has a very likely explanation. Several decades ago, a group of patients with severe, prolonged anginal pain at rest that differed from stable angina, but sometimes preceded AMI, was described [43, 44]. The analytic sensitivities of the assays for cTn have improved progressively during the past years, and cTn has become detectable in an even larger fraction of patients, reducing the proportion of ACS patients with UA [45]. This reclassification of patients is of clinical importance because it increased the diagnosis of AMI among patients with acute chest pain: patients recently classified as having MI are treated more aggressively and their clinical outcomes have improved [46]. It is now evident that a large majority of patients with clinical manifestations of myocardial ischemia, with chest pain but without elevated circulating cTn measured by a conventional assay and, therefore, considered to have UA have an elevated cTn measured by a high-sensitivity cTn assay and are classified as NSTEMI nowadays. As a consequence, UA is likely to be a further marginalized diagnosis, and patients with a diagnosis of UA actually have a good prognosis [47]. For some experts, it is not clear that ACS events can occur without some increase in circulating high-sensitivity cTn assay [48]. This hypothesis could explain why we found similar survival rates between geriatrics patients with UA and those with non-ACS chest pain, but this needs to be demonstrated by a prospective study.

Limitations

This study has some important limitations. First, the patients were not prospectively enrolled in a specific manner for the clinical investigation, and the sample is not necessarily representative of the entire population of octogenarians admitted to the ED because this was a single-center study. Second, we were unable to determine the cause of death in most patients, so we were only able to measure the overall mortality rate. Finally, no indicators of functionality or fragility of patients were measured and few patients underwent coronarography; as in any nonexperimental study, it is not possible to eliminate the bias corresponding to residual confounding or time-dependent variables that were not measured.

Conclusions

A high prevalence of ACS was observed among octogenarian chest pain patients in an ED, with a high proportion of female patients. The ACS type behaved as an independent predictor of mortality at 40 months of follow-up and myocardial revascularization was associated with reduced mortality though this finding is subject to selection bias in this small subset. Patients with a diagnosis of UA had a similar prognosis to patients with non-ACS chest pain but it needs to be demonstrated by a prospective study.

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Compliance with ethical standards

Conflict of interest Not applicable. On behalf of all the authors, the corresponding author states that there is no conflict of interest.

Ethics approval The study protocol was classified as a risk-free investigation and approved by the Institutional Research Ethics Committee.

Consent to participate Not applicable. This was a retrospective study.

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