Original paper

Characteristics of pain manifestation in elderly patients with acute coronary syndrome

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Summary

Objectives: The aim of this study is to evaluate prognostic value and clinical characteristics of the presentation of acute coronary syndrome (ACS) in elderly patients.

Design and methods: 193 patients over 75 years old hospitalized with ACS were evaluated by clinical presentation, treatment strategy and treatment results. Patients were followed up for 3 years. 13% of patients had no chest pain.

Results: The patients who had no pain, had a greater manifestation of acute congestive heart failure according to Killip classes ($p = 0.002$), more frequent atrio-ventricular conduction delay ($p = 0.033$), lower systolic blood pressure ($p = 0.047$), higher concentration of creatinine ($p = 0.01$) and CRPhs ($p = 0.006$). 3 vessel disease in patients with ACS without pain was detected more frequently than changes in one or two coronary arteries ($p = 0.002$). For treatment of such patients, diuretics ($p = 0.033$) and intra-aortic balloon pumping ($p = 0.006$) and CABG ($p = 0.006$) were applied more often. Mortality rates for patients who had ACS without pain were higher after 1 year ($p = 0.023$), 2 years ($p = 0.034$) and 3 years ($p = 0.012$) compared to patients who had pain.

Conclusion: ACS without pain determined a more expressed heart failure in patients compared to those who had ACS with pain (68.2% vs 35.1%, $p = 0.002$) and, also more frequent AV conduction delay (85.7% vs 68.1%, $p = 0.033$). For treatment of patients without pain, diuretics (83.9% vs 63.7%, $p = 0.033$), catecholamines (35.9% vs 20.9%, $p = 0.07$) were more often used as well as CABG (36.0% vs 12.5%). The elderly patients with ACS without pain have worse long-term rates of cardiovascular death despite the treatment strategy applied (invasive or conservative): after 1 year (63.6% vs 38.2%, $p = 0.023$), after 2 years (63.6% vs 40.0%, $p = 0.034$) and after 3 years (77.9% vs 46.4%, $p = 0.012$).

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Introduction

Aging of human population is a clear sign of the success of the mankind as the society is able to enjoy the "luxury of aging". The population is getting older due to the following factors within the society: development of healthcare system, education of the society, rising global economy. Fast growing population of elderly people is a social phenomenon without precedent. It destroys already formed stereotypes concerning "an elderly person". Presently, the lifetime forecast at birth is 76–80 years in the developed countries. Nevertheless, constant aging of the human population is a real challenge to the healthcare system [1].

The prime cause for this challenge is the specific characteristics of acute coronary syndrome (further on referred to as – ACS) in elderly patients. It is known that higher morbidity and mortality rates for ACS are inherent to the elderly population [2–5]. Changes in heart and coronary, also renal and respiratory systems developing with age account for the high morbidity and mortality rates [3–7]. However, another cause for high mortality rates is the fact that elderly patients have atypical form of ACS [4] which results in delayed treatment of patients within this age

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group [2,9–12]. Most authors call ACS "atypical" when patients do not feel pain in the chest and "typical" when they do feel pain in the chest [8, 9,11].

Design and methods

This study conforms to the principles outlined in the Declaration of Helsinki and has been approved by the Lithuanian Bioethics Committee (ref. no. 11, issued on April 23, 2007). The goal of this study is to compare clinical presentation, treatment strategy and treatment results of ACS in elderly patients experiencing pain with the clinical presentation, treatment strategy and treatment results of ACS in elderly patients without pain.

Study population

193 patients over 75 years old hospitalized with ACS at the Department of Intensive Cardiology of Vilnius University Hospital Santariskiu Klinikos in 2007–2010. Acute coronary syndrome involved unstable angina (UA), acute myocardial infarction without ST elevation (NSTEMI) and acute myocardial infarction with ST elevation (STEMI). This study took into consideration classification of patients with ACS into two groups: patients in one group had pain while patients in the other group had no pain.

Acute coronary syndrome [2,5–7] was diagnosed according to the symptoms of acute ischemic heart disease with at least one of the following symptoms: increased markers of myocardial necrosis, newly presented changes in ECG (new changes of ST and T, left bundle branch block (further on referred to as LBBB) on the index, pathological Q). STEMI was diagnosed after detection of elevated markers of myocardial necrosis and ST elevation ≥ 1 mm in any location or a newly developed LBBB. NSTEMI was diagnosed for patients with increased markers of myocardial necrosis without ST elevation in ECG. UA was diagnosed for patients when the markers did not exceed the upper limit of the range.

Patients participating in the study were evaluated by age, gender, comorbidities, prior MI, prior stroke or transient ischemic attack, prior angiography detecting coronary artery stenosis $\geq 50\%$, prior angioplasty or bypass surgery, prior heart failure, heart rate and arterial blood pressure on admission, Killip class at the initial evaluation, plasma natriuretic peptides, CRPhs, troponin I, renal function, changes in ECG, treatment strategy (conservative or invasive), pathological changes in coronary vessels, pharmacological treatment, intra-aortic balloon pumping, mechanical lung ventilation, in-hospital mortality as well as mortality in a one, two or three year period following the hospitalization. Two groups of patients were formed: patients with pain and patients without pain (ACS in them manifested dyspnoea, syncope, presyncope, vomiting, nausea, diaphoresis).

Statistical analysis

Data were processed using statistical software package SPSS 17.0 (version for Windows). Descriptive statistics for quantitative variables in the tables were described as an average ($\pm$SD) while for the qualitative variables were calculated in percentage points (%).

To compare the two groups with regard to the quantitative variable the *t*-test or non-parametric Mann-Whitney test (if the data dispersion is uneven) was applied. For comparison of more than two groups with regard to the quantitative variable unifactorial dispersion analysis (Welch test used in case of uneven dispersions of the statistics) was applied. χ^2 test was applied while analyzing the relationship with one equivocal variable.

Results

The total number of patients involved in our study was 193. All of them were over 75 years old and had ACS on admission. The average age of the patients was 80.79 ± 4.49 years. The oldest patient was 97 years old. Female patients accounted for 66.84% of participants. 13% of patients had no chest pain.

The study revealed that the patients with the history of coronary disease determined by stenosis $\geq 50\%$ had a higher prevalence of ACS with pain ($p = 0.01$).

Parameters defining the state of the patient on arrival at hospital are given in Table 2 and Table 3. With reference to the given data we can state that in the patients who had no pain, there was a greater manifestation of acute congestive heart failure according to Killip classes ($p = 0.002$), more frequent atrio-ventricular conduction delay ($p = 0.033$), lower systolic blood pressure ($p = 0.047$), higher concentration of creatinine ($p = 0.01$) and CRPhs ($p = 0.006$).

When comparing treatment strategies by the criteria of pain presentation, it was observed that invasive treatment strategy was applied with equal frequency for both groups of patients participating in the study. However, during the angiography, 3-vessel disease in patients with ACS

Table 1.
Comparison of demographic and medical history characteristics

Characteristics		*N*	With pain (%)	Without pain (%)	*p*
Number of patients		193	87.0	13.0	
Age	75–79 years old	86	44.6	44.0	0.624
	80–84 years old	66	35.1	28.0	
	≥85 years old	41	20.2	28.0	
Gender	Male	64	31.0	47.9	0.074
	Female	129	69.0	52.1	
Diagnosis	UA	40	22.6	8.0	0.169
	STEMI	51	26.8	24.0	
	NSTEMI	102	50.6	68.0	
Diabetes mellitus	Yes	39	19.6	24.1	0.391
	No	154	80.4	75.9	
Hypertension	Yes	159	83.9	72.0	0.121
	No	34	16.1	28.0	
Stroke or TIA	Yes	49	25.6	23.9	0.542
	No	144	74.4	76.1	
Myocardial infarction	Yes	56	30.4	19.9	0.206
	No	137	69.6	80.1	
Stenosis ≥50%	Yes	31	17.3	8.1	**0.010**
	No	41	17.9	44.0	
	Do not know	121	64.9	48.0	
Coronary angioplasty	Yes	16	9.5	0.0	0.098
	No	177	90.5	100.0	
CABG	Yes	7	3.6	4.0	0.628
	No	186	96.4	96.0	
Heart failure	Yes	22	11.9	8.0	0.433
	No	171	88.1	92.0	

CABG – coronary artery bypass graft surgery, NSTEMI – non-ST-segment elevation myocardial infarction, STEMI – ST-segment elevation myocardial infarction, TIA – transitoric ischemic attacks, UA – unstable angina.

Table 2.
Comparison of patients' characteristics and laboratory markers

Characteristics	With pain (*N* = 166)	Without pain (*N* = 25)	*p*
Pulse, mean, beats/min	80.08 ± 21.99	81.24 ± 27.66	0.812
Systolic blood pressure, mean, mmHg	137.65 ± 30.08	124.20 ± 38.76	**0.047**
Troponin I µg/L	57.14 ± 129.97	73.32 ± 115.64	0.557
CRP-hs mg/l	18.70 ± 36.58	42.20 ± 53.56	**0.006**
Creatinine µmol/l	104.76 ± 35.46	127.16 ± 63.33	**0.010**
proBNP (16–24 h) ng/ml	5776.12 ± 8568.18	9532.18 ± 10166.97	0.057

Table 3.
Comparison of ECG characteristics and heart failure in patients during hospitalization

Characteristics		*N*	With pain (%)	Without pain (%)	*p*
ST-segment elevation	Yes	95	47.0	63.9	0.085
	No	98	53.0	36.1	
ST-segment depression	Yes	67	35.1	31.9	0.475
	No	126	64.9	68.1	
AV conduction disturbances	Yes	32	14.3	31.9	**0.033**
	No	161	85.7	68.1	
Killip class	I	117	64.9	31.8	**0.002**
	II, III, IV	76	35.1	68.2	

Table 4.
Comparison of treatment strategies

Variables		*N*	With pain (%)	Without pain (%)	*p*
Coronary angiography	Yes	143	75.6	64.0	0.161
	No	50	24.4	36.0	
Findings	3-vessel disease	46	28.1	58.8	**0.002**
	Left main stem disease	5	2.3	11.8	
	0, 1, 2-vessel disease	94	69.5	29.4	
PCI	Yes	99	53.0	39.9	0.160
	No	94	47.0	60.1	
CABG	Yes	30	12.5	36.0	**0.006**
	No	163	87.5	64.0	
Catecholamine support	Yes	43	20.3	35.9	0.070
	No	150	79.7	64.1	
Diuretics	Yes	128	63.7	83.9	**0.033**
	No	65	36.3	16.1	
Mechanical lung ventilation	Yes	23	10.7	19.9	0.156
	No	170	89.3	80.1	

CABG – coronary artery bypass graft surgery. IABP – intra-aortic balloon pump. PCI – percutaneous coronary intervention.

without pain were detected more frequently than changes in one or two coronary arteries (p = 0.002). For treatment of such patients diuretics (p = 0.033) and intra-aortic balloon pumping (p = 0.006) and CABG (p = 0.006) were applied more often (see Table 4). The information on fibrinolysis, hemofiltration and hemodialysis are not analyzed because of the insignificant number of patients who underwent this treatment and insufficient data dispersion (e.g. fibrinolysis was applied to 6 patients, and all of them had pain on arrival at hospital).

Comparison of treatment results was based on in-hospital, 6 months, 1, 2 and 3 year mortality rates. Their in-hospital and 6 month mortality rates were similar and did not represent any statistically significant difference. Mortality rates for patients who had ACS without pain were higher after 1 year (p = 0.023), 2 years (p = 0.034) and 3 years (p = 0.012) compared to patients who had pain.

Discussion and novelty

The aim of the study was to evaluate the characteristics of pain presentation in elderly patients with ACS. So far such studies have not been carried out in Lithuania. The study revealed that 13% of the patients who received treatment in the Department of Intensive Cardiology of Vilnius University Hospital Santariskiu Klinikos in

Table 5.
Comparison of treatment results

Variables*		*N*	With pain (%)	Without pain (%)	*p*
Mortality within 3 years	Died	66	46.4	77.9	**0.012**
following hospitalization	Alive	64	53.6	22.1	
Mortality within 2 years	Died	66	40.0	63.6	**0.034**
following hospitalization	Alive	86	60.0	36.4	
Mortality within 1 year	Died	66	38.2	63.6	**0.023**
following hospitalization	Alive	92	61.8	36.4	
Mortality within 6 months	Died	45	24.7	33.4	0.253
following hospitalization	Alive	129	75.3	66.6	
In-hospital death	Died	36	17.3	27.9	0.156
	Alive	157	82.7	72.1	

*Smaller number of patients after 6 months and 1, 2 and 3 years compared to the number of patients still at hospital due to limited possibilities to get in touch with them (e.g. changed telephone number); also, due to the peculiarities of the study since it was carried out in 2007–2010 and with some patients the period after their hospitalization is still shorter than 1, 2 or 3 years.

2007–2010 for ACS had no pain at all. According to GRACE, such patients accounted for 8.4% of the patients admitted to hospital with diagnosed ACS [9]. According to NRMI-2, the proportion of such patients was even bigger – up to 33%.

According to NRMI-2, for patients without pain ECG was performed approximately after 32 minutes while for patients who had pain this time was as short as 16 minutes. Invasive treatment was also applied with delay. E.g., fibrinolysis for patients without pain in the chest was performed only after 140 minutes on the average while for patients with pain it was performed approximately after 65 minutes. The difference for PCI timing in the two groups was approximately 110 minutes [10]. According to GRACE, patients with atypical ACS presentation would arrive at hospital also with a greater delay than those with typical clinical presentation (3.2 h vs 2.9 h, $p < 0.02$) [9].

Due to the delayed arrival at hospital and delayed treatment, the duration of ischemia is getting longer also, the myocardium is affected more. This could be the key to the findings of our study indicating a greater damage of the myocardium: higher CRPhs, more frequent AV conduction delay and more frequent presentation of acute heart failure. According to GRACE, 42% of patients with atypical ACS had N II–IV Killip class heart failure on arrival at hospital (patients with typical pain accounted for only 16.1%, $p < 0.001$) [9]. According to our study, such patients accounted for 35.1%. Naturally, balloon pumping as well as catecholamines and diuretics were more often applied to such patients.

The group of patient with pain was different from the group of patient without pain: systolic blood pressure in patients without pain on arrival at hospital was lower, and the concentration of creatinine in their blood was higher. Such characteristics could be attributed to the fact that this group was made of patients with ACS manifesting syncope, presyncope, nausea, vomiting presumably caused by law systolic blood pressure and AV conduction delay. A lower blood pressure could have resulted in impaired renal function. Other characteristics of this group are more frequent cases of 3 vessel disease.

Conclusions

ACS without pain determined a more expressed heart failure in patients compared to those who had ACS with pain (68.2% vs 35.1%, $p = 0.002$) and also, more frequent AV conduction delay (85.7% vs 68.1%, $p = 0.033$). For treatment of patients without pain, diuretics (83.9% vs 63.7%, $p = 0.033$), catecholamines (35.9% vs 20.9%, $p = 0.07$) were more often used as well as CABG (36.0% vs 12.5%). The data collected in this study suggest that elderly patients with ACS without pain have worse long-term rates of cardiovascular death despite the treatment strategy applied (invasive or conservative): after 1 year (63.6% vs 38.2%, $p = 0.023$), after 2 years (63.6% vs 40.0%, $p = 0.034$) and after 3 years (77.9% vs 46.4%, $p = 0.012$).

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