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Long-term major adverse cardiovascular events and quality of life after coronary angiography in elderly patients with acute coronary syndrome

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ABSTRACT

Background: Although the elderly comprise the majority of acute coronary syndrome (ACS) patients, limited data exist on major adverse cardiovascular events (MACEs) and quality of life (QoL).
Objectives: To study MACEs and QoL prospectively in ACS patients >70 years referred for coronary angiography.
Methods: A prospective observational study that included ACS patients >70 years undergoing coronary angiography. The outcomes were MACEs and QoL 3 years after inclusion. MACEs were defined as death, recurrent ACS, new-onset of heart failure and repeated revascularization by coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI). A QoL questionnaire was completed by the patients along with a physical examination and a personal interview at the 3-year follow-up. Multivariate analysis was performed to identify the predictors for MACEs.
Results: In total, 138 patients (mean age 78.8 ± 3.8 years) with ACS were included in the study. Mean follow-up was 1196 ± 296 days. In all, 42% of the patients had MACEs and 25% had post-ACS heart failure. The mortality rate was 11%. After adjusting for significant cardiovascular risk factors, the following factors were significantly associated with MACEs: Age, high-sensitive troponin T (hsTNT), use of diuretics and reduced left ventricular ejection fraction (LVEF). Furthermore, the QoL evaluated with SF-36 in survivors from ACS at the end of study was similar to the QoL in an age-matched healthy Swedish population.
Conclusions: In this prospective study on elderly ACS patients MACEs still occurred in 42% of the cases (despite low mortality and good QoL), with post-ACS heart failure as the most important event.

1. Introduction

The elderly population in today's society is growing rapidly and living longer. As a result, we see a rising prevalence of cardiovascular disease in this age group [1]. During the past few decades, the management of acute coronary syndrome (ACS) has continuously improved, which is largely due to the widespread use of percutaneous coronary intervention (PCI), dual anti-platelet therapy, statins, beta-blockers and angiotensin-converting enzyme (ACE) inhibitors. [2,3]. However, despite this advancement in management, age and co-morbidities in the elderly impair the prognosis of ACS.

Several registry-based studies have demonstrated that older patients with ACS have a higher mortality than the younger population, especially in those older patients receiving conservative treatment [4–6]. About 25–30% of patients with ACS develop heart failure and about 40% develop left ventricular systolic dysfunction (LVSD) [7–9]. Further, the incidence of LVSD after ACS is higher in the elderly population [10,11]. In addition, patients with lower left ventricular ejection fraction (LVEF) and heart failure after ACS have a higher mortality rate compared to patients with normal LVEF [8,12–14]. Recently, a registry study (296 patients aged >80 years) demonstrated significantly increased MACEs in elderly patients with ACS compared with a younger ACS population [11]. However, prospective studies comparing an invasive approach (PCI) with conservative treatment in the elderly showed that patients in the PCI group had less MACEs and lower mortality than the conservative treatment group (LVEF <50% was the strongest predictor for increased mortality) [15,16]. Therefore, there seems to be sufficient evidence to support an invasive strategy in elderly patients with ACS. However, data on long-term prognosis with special emphasis on heart failure are limited. Moreover, there is currently no information on quality of life (QoL) in the elderly ACS cohort.

Given the limited data on outcome and QoL in elderly patients with ACS who receive reperfusion therapy, as well as the multifactorial nature of the prognosis of the elderly population, this prospective observational study examined both outcomes and QoL in elderly ACS patients undergoing coronary angiography. For this purpose, a 3-year follow-up

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Table 1
Patient baseline characteristics.

	Total (n = 138)	No MACE (n = 80)	MACE (n = 58)	p-Value
Female sex, n(%)	33 (24)	20 (25)	13 (22)	0.443
Age at hospitalization, mean(SD)	78.8 (3.8)	76.7 (5.1)	78.7 (4.4)	0.015
PCI, n(%)	103 (75)	60 (75)	43 (74)	0.531
CABG during admittance, n(%)	14 (10)	10 (13)	4 (7)	0.217
PCI indication				
STEMI, n(%)	60 (44)	32 (40)	28 (48)	0.214
NSTEMI, n(%)	59 (43)	24 (41)	35 (44)	0.459
Unstable angina, n(%)	19 (14)	13 (16)	6 (10)	0.230
Medical history				
Hypertension, n(%)	80 (57)	44 (55)	35 (60)	0.326
Previous Ischemic heart disease, n(%)	51 (37)	27 (34)	24 (41)	0.230
Diabetes, n(%)	21 (15)	14 (18)	7 (12)	0.264
COPD, n(%)	9 (7)	3 (4)	6 (10)	0.116
Prior stroke, n(%)	16 (12)	9 (11)	7 (12)	0.544
Prior CABG, n(%)	17 (12)	7 (9)	10 (17)	0.109
Pacemaker, n(%)	4 (3)	2 (3)	2 (3)	0.561
Prior heart failure, n(%)	7 (5)	5 (6)	2 (3)	0.372
Clinical findings				
HR at hospitalization, mean(SD)	77 (22)	74 (15)	74 (21)	0.939
SBP at hospitalization, mean (SD)	142 (24)	151 (27)	141 (22)	0.019
DBP at hospitalization, mean (SD)	85 (24)	85 (16)	82 (15)	0.259
Ejection fraction <50%, n(%)	53 (38)	19 (24)	34 (59)	<0.001
Increased PA pressure, n(%)	8 (6)	2 (3)	6 (10)	0.062
Regional wall motion abnormality, n(%)	92 (68)	47 (60)	45 (78)	0.025
Enlarged left atrium, n(%)	34 (25)	15 (19)	19 (33)	0.055
Left bundle branch block, n(%)	12 (9)	5 (6)	7 (12)	0.186
Normal sinus rhythm, n(%)	119 (86)	73 (91)	46 (79)	0.040
Atrial fibrillation, n(%)	14 (10)	5 (6)	9 (16)	0.068
Laboratory findings				
eGFR (cockroft-gault), mean (SD)	64 (23)	70 (24)	68 (21)	0.698
Cholesterol, mean (SD)	4.8 (1.0) n = 122	4.7 (1.2) n = 72	4.3 (0.9) n = 50	0.026
LDL, mean (SD)	3.0 (0.8) n = 121	3.0 (1.1) n = 72	2.6 (0.8) n = 49	0.026
TNT, median (IQR)	3065 (5759)	460 (1489)	1840 (5030)	0.002
TNT (log.), mean(SD)	6.3 (2.0)	5.9 (2.0)	6.9 (1.9)	0.003
Medications at discharge				
ACE/ARB, n(%)	119 (86)	71 (88.8%)	48 (82.8%)	0.223
Dose >50 for those using ACE/ARB, n(%)	68 (57)	38 (53.5%)	30 (62.5%)	0.217
Target dose ACE/ARB, n(%)	25 (21)	14 (19.7%)	11 (22.9%)	0.421
Beta blockers, n(%)	118 (86)	66 (83)	52 (90)	0.176
Beta blockers dose >50, n(%)	76 (64)	41 (62)	35 (67)	0.349
Beta blockers, target dose, n(%)	11(9)	3 (5)	8 (15)	0.045
Mineralocorticoid receptor antagonists, n(%)	6 (4)	1 (1)	5 (9)	0.047
Statins, n(%)		80 (100)	58 (100)	
Acetylsalicylic acid, n(%)	135 (98)	78 (98)	57 (98)	0.619
Anticoagulants, n(%)	11 (8)	3 (4)	8 (14)	0.034
Diuretics, n(%)	35 (25)	12 (15)	23 (40)	0.001
Platelet inhibitor (P2Y12 receptor antagonists), n(%)	122 (88)	71 (89)	51 (88)	0.544

*Comparison of differences between the groups using the t-test for continuous and the chi-square test for categorical variables. For categorical variables n (%) is presented.
For continuous variables mean (SD)/median (Min; Max)/n = is presented.
#Abbreviations: SD, standard deviation; COPD, chronic obstructive pulmonary disease; PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; SBP, systolic blood pressure; DBP, diastolic blood pressure; Bpm; beats per minute; PA, pulmonary artery; eGFR, estimated glomerular filtration rate; ACE, Angiotensin converting enzyme inhibitors; ARB, Angiotensin receptor blockers.

after inclusion was performed comprising a physical examination, a personal interview and QoL questionnaire.

2. Methods

2.1. Study cohort

138 patients ≥70 years referred for coronary angiography after ACS were prospectively included at Sahlgrenska University Hospital during ordinary office hours. The study was initiated on October 21st 2010 and ended on December 31st 2014. Inclusion criteria were written consent within 24 h after the angiography and age ≥70 years. The only exclusion criterion was not being willing or able to sign a written consent. The study protocol was approved by The Human Ethical Committee at the University of Gothenburg. The study protocol conforms to the ethical guidelines of the Declaration of Helsinki

2.2. Laboratory analysis

Blood samples were acquired at the time of inclusion. All analyses were performed routinely at the hospital laboratory and all results from blood tests were documented in the patients' medical records.

2.3. Follow-up

All patients were scheduled for at least two follow-up visits: one is a clinical routine follow-up 6–8 weeks after hospital discharge while the other was the study follow-up at 3 years after inclusion. At the 3 year follow-up, a cardiologist conducted a physical examination and a personal interview. Moreover, ECG, vital parameters and major adverse cardiovascular events (MACE) were registered and a QoL questionnaire (36-Item Short Form Health Survey, SF 36) was completed by the patients.

2.4. Data collection

All data were based on the patients' self-reports and verified by medical journals: previous medical history, echocardiography, results of angiography and PCI. Further, for the purpose of diagnosing post-ACS heart failure, data were collected for symptoms of heart failure during the hospital stay and at the routine 6–8 week follow-up. Post-ACS heart failure was divided into early (≤1 week after ACS) and late (≥1 week after ACS). The diagnosis was based on LVEF, N-terminal of the prohormone brain natriuretic peptide (NT-proBNP) and symptoms of heart failure according to The European Society of Cardiology (ESC) guidelines [17]. Likewise, the diagnosis of ACS was based on ESC guidelines [2,18].

2.5. Quality of life evaluation

Health-related QoL was assessed using the Swedish version of the medical outcomes study SF-36. The SF-36, a norm-referenced measure of QoL, contains 36 items to measure 8 QoL domains from the patient's point of view: physical functioning, physical role, bodily pain, general health perceptions, vitality, social functioning, emotional role and mental health. Results were scored by the licensed Quality Metric Health Outcomes Scoring Software 4.0. The results were compared with age-matched reference values from the Swedish SF-36 normative population. The Swedish version of the SF-36 has shown good reliability and validity [19,20].

2.6. Endpoints

The primary endpoints were MACEs and the secondary endpoint was QoL. MACEs were defined as death, recurrent ACS, new-onset of heart failure during index hospitalization or the occurrence of heart failure during follow-up and the need for repeated revascularization by CABG or PCI.

Table 2
Outcome and its components at follow-up.

	N (%)
MACE	58(42)
Death	15(10.9)
Early post-ACS heart failure	25(18.1)
Late post-ACS heart failure	9 (6.5)
Stroke	10 (7.4)
Recurrent ACS	16(11.8)
Recurrent PCI	15(11.1)

Abbreviations: ACS, acute coronary syndrome; PCI, percutaneous coronary intervention; CCS, Canadian Cardiovascular Society grading of angina pectoris.