

What kind of patients most often undergo isolated CABG? Characteristics of patients undergoing isolated CABG — a single-center study

Jacy chorzy są najczęściej poddawani izolowanemu CABG?
Charakterystyka chorych poddawanych izolowanemu CABG
— badanie jednośrodkowe

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Lekarz Olga Jelonek jest absolwentką Wydziału Lekarskiego Uniwersytetu Medycznego w Lublinie. Obecnie odbywa szkolenie specjalizacyjne z kardiologii w I Klinice Kardiologii i Elektroterapii Świętokrzyskiego Centrum Kardiologii w Kielcach pod kierownictwem prof. dr hab. n. med. Beaty Wożakowskiej-Kapłon. Klinika specjalizuje się w diagnostyce i leczeniu zaburzeń rytmu serca (implantacja stymulatorów, ICD, CRT, badania elektrofizjologiczne, ablacje). W kręgu zainteresowań medycznych dr Jelonek pozostają: diagnostyka i leczenie choroby wieńcowej, terapia przeciwkrzepliwa, hipertensjologia. W wolnym czasie zajmują ją sport oraz muzyka.

Abstract

Introduction. Coronary artery bypass grafting (CABG) is a method of treating coronary artery disease in patients with a variety of co-morbidities and at different age. The aim of the study was to characterize patients undergoing isolated coronary artery bypass surgery.

Material and methods. Retrospective analysis included medical records of patients operated in the Cardiac Surgery Department of Świętokrzyskie Center of Cardiology from 2009 to 2011. The inclusion criterion in the study was an isolated coronary artery bypass surgery in patients without atrial fibrillation prior to surgery.

Results. A total of 791 patients were enrolled. Men accounted for 74.3% (n = 588) of the subjects. The mean age of patients in the study was 64.6 (± 9.1) years. The majority of patients were aged 60–69. Hypertension occurred in 607 out of 791 patients (76.7%). Heart failure was reported in 20.6% (n = 163) of patients undergoing CABG. The mean number of implanted grafts was 2.7 ± 0.5. The left anterior descending coronary artery was revascularized in 99.5% (n = 787) patients. Postoperative complications after CABG occurred in 41% of patients.

Conclusions. Men were more likely to undergo isolated CABG than women. The largest group of patients undergoing isolated CABG were those aged 60–69 years. Most patients undergoing isolated CABG had hypertension. Postoperative complications were observed in 41% of the patients, mostly low output syndrome.

Key words: isolated CABG, revascularization, arterial hypertension, heart failure

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Introduction

Coronary artery disease (CAD) remains the leading cause of death in both developed and developing countries. One of the methods used to treat advanced CAD is coronary artery bypass grafting (CABG). This is the most common cardiac surgery and the number of people undergoing CABG is constantly increasing. The aim of this operation is to bypass the severely constricted coronary arteries in order to obtain cardiac revascularization, improve the quality of life and general condition of the patient and, above all, reduce the risk of death, especially due to cardiovascular diseases. Despite the tremendous progress in cardiac surgery and interventional cardiology, the risk of cardiovascular death continues to increase and the complication rate of cardiac surgery still remains high. This is undoubtedly related to a change in the profile of patients undergoing CABG – they are often elderly, with many concomitant diseases. The aim of this paper is to characterize patients undergoing isolated CABG [1–3].

Material and methods

Retrospective analysis included medical records of patients operated in the Cardiac Surgery Department of Świętokrzyskie Center of Cardiology from 2009 to 2011. The inclusion criterion for the study was an isolated CABG surgery. Excluded from the study were patients:

- who underwent CABG concomitantly with valvular surgery, carotid angioplasty, postinfarction ventricular septal defect closure, or ventricular aneurysm repair;
- with a history of atrial fibrillation prior to CABG.

The following variables were assessed in all patients: age, gender, selected echocardiographic parameters, the cause of hospitalization, intraoperative data (number and types of bypass grafts), postoperative complications, pharmacotherapy prior to hospitalization, co-morbidities, i.e. hypertension, heart failure, impaired renal function (glomerular filtration rate [GFR] < 60 mL/min), dyslipidemia, type 2 diabetes, thyroid disease (hyperthyroidism, hypothyroidism, euthyroid goiter), chronic obstructive pulmonary disease, atherosclerosis of the lower limbs.

Statistical analysis

Statistical analysis was performed on clinical and echocardiographic data. The arithmetic mean, standard deviation, median, maximum and minimum values were determined for the individual parameters. The following models of statistical analysis were used in the study: χ^2 test to establish whether a single nominal variable was significantly different from the expected value and to determine whether there was a relationship between two categorical variables; Student's *t*-test for comparison of normally distributed data and Mann-Whitney test for comparison of non-normally dis-

tributed data between groups. The statistical significance of differences was determined by the *p* value; *p* values less than 0.05 were considered statistically significant. Univariate and multivariate logistic regression analyses were used to determine the predictive value of selected features.

Results

Overall, 791 patients were included in the study. Of these, 74.3% (*n* = 588) were men. The mean age of the patients was 64.6 (\pm 9.1) years: 63.8 (\pm 9.1) years for men and 67.1 (\pm 8.7) years for women (*p* < 0.0001). The most prevalent age group included patients aged 60–69 years who accounted for 34.8% of all study participants. The majority of women (73 patients, 36% of all women) were 70–79 years old. The most numerous group of men (206 patients, 35% of all men) were those aged 60–69 years (Figure 1).

The disease that most commonly coexisted with coronary artery disease in patients undergoing isolated CABG was hypertension. It was diagnosed in 607 out of 791 patients, i.e. 76.7% of all patients (Table 1).

Heart failure occurred in 163 patients undergoing CABG, which accounted for 20.6% of all patients. Most patients with heart failure were in New York Heart Association (NYHA) class II (*n* = 93, 57.1% of all heart failure patients), followed by NYHA class I and NYHA class IV – in 14.7% (*n* = 24) and 1.8% (*n* = 3) of patients with heart failure, respectively.

The most common cause of coronary angiography prior to CABG in the evaluated group of patients was unstable angina – it was performed in 258 patients, which accounted for 39% of patients with acute coronary syndrome and 32.6% of all patients. Severe coronary syndrome was the cause of coronary angiography in 83.4% of patients (*n* = 660). Coronary angiography due to stable angina pectoris was performed in 131 patients, which accounted for 16.6% of patients undergoing CABG surgery (Figure 2).

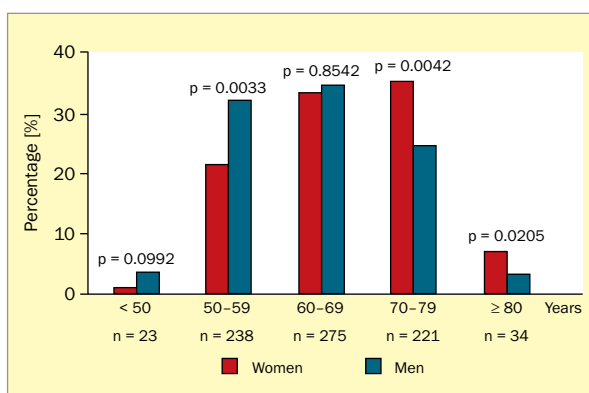
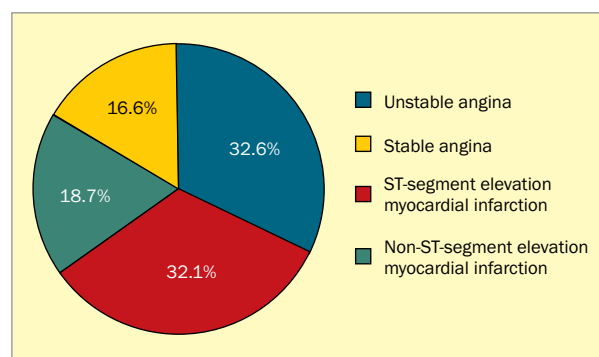


Figure 1. Age distribution according to gender

Table 1. Characteristics of patients undergoing isolated CABG

Clinical data	Number of patients n = 791 (% of patients)	Number of women n = 203 (% of women)	Number of men n = 588 (% of men)	p-value
Cardiovascular risk factors				
Hypertension	607 (76.7)	169 (83.3)	438 (74.5)	0.01085
Dyslipidemia	421 (53.2)*	114 (56.2)	307 (52.2)	0.33
Hypercholesterolemia	336 (42.5)	94 (46.3)	242 (41.2)	0.20
Hypertriglyceridemia	9 (1.1)	4 (1.9)	4 (0.7)	0.11
Mixed dyslipidemia	76 (9.6)	16 (7.9)	60 (10.2)	0.33
Type 2 diabetes	204 (25.8)	67 (33.0)	137 (23.3)	0.0064
Comorbidities				
Impaired renal function [GFR < 60 mL/min]	193 (24.4)	86 (42.4)	107 (18.2)	0.000001
Heart failure	163 (20.6)	41 (20.2)	122 (20.8)	0.87
Thyroid disease	62 (7.8)	31 (15.3)	31 (5.3)	0.000001
Hyperthyroidism	32 (4)	14 (6.9)	18 (3.1)	0.034
Hypothyroidism	24 (3)	15 (7.4)	9 (1.5)	0.00003
Euthyroid goiter	6 (0.8)	2 (0.9)	4 (0.7)	0.67
Chronic obstructive pulmonary disease	42 (5.3)	10 (4.9)	32 (5.4)	0.99
Atherosclerosis of the lower limb	41 (5.2)	7 (3.5)	34 (5.8)	0.19
History of stroke/TIA	38 (4.8)	6 (2.9)	32 (5.4)	0.15

*Due to lipid-lowering therapy, the prevalence of dyslipidemia is underestimated; GFR – glomerular filtration rate; TIA – transient ischemic attack

**Figure 2.** Types of ischemic heart disease in patients undergoing coronary artery bypass grafting surgery

In the present study, transthoracic echocardiographic parameters were also assessed (Table 2). Mean left ventricular ejection fraction was 50.4%. The analysis of the parameters showed the borderline mean value of average left ventricular dimension (39.7 mm) and increased mean interventricular septum thickness (11.8 mm) in patients undergoing CABG.

The assessment of medications used prior to CABG surgery demonstrated that antiplatelet drug(s) were taken

by 78.9% (n = 624), low molecular weight heparin by 16.2% (n = 128), angiotensin converting enzyme inhibitors by 91.2% (n = 721), angiotensin II AT1 receptor blockers by 7.6% (n = 60), statin by 92.3% (n = 730), beta-adrenolytics by 86.3% (n = 683), and diuretics by 35.4% (n = 280) of the CABG patients (Figure 3).

Urgent CABG was performed in 297 patients, which accounted for 37.5% of all patients. Among patients who underwent urgent CABG, 99 patients (33.3% of patients operated urgently) had critical stenosis of left main coronary artery, 172 patients (57.9% of patients operated urgently) were hemodynamically instable and in 26 patients (8.8% of urgently operated patients) left main coronary artery stenosis coexisted with hemodynamic instability.

The mean number of implanted bypass grafts in the study group was 2.7 ± 0.5 (Figure 4). Single graft was implanted in 47 patients, which accounted for 5.9% of the patients. Only one patient received 5 grafts. The most common group were patients with three grafts (52.7% of patients, n = 417). Arterial grafts were implanted in 43 patients (5.4%), venous grafts in 40 patients (5.1%). In the remaining 89.5% of patients (n = 708), both arterial and venous grafts were implanted. The most frequently bypassed coronary artery in the study group was the left

Table 2. Transthoracic echocardiographic parameters in the examined group

	EF [%]	LA [mm]	RV [mm]	LVD [mm]	LVs [mm]	IVS [mm]
Mean	50.4	39.7	26.7	53.1	37	11.8
SD (±)	10.7	4.9	3.4	6.3	7.1	1.6
Median	50	40	27	53	36	12
Minimum	20	24	18	34	22	7
Maximum	75	63	40	78	68	19

EF – ejection fraction; LA – left atrium; RV – right ventricle; LVD – left ventricular end-diastolic dimension; LVs – left ventricular end-systolic dimension; IVS – interventricular septum; SD – standard deviation

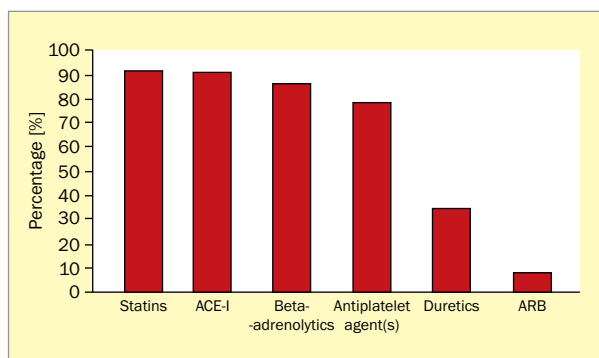


Figure 3. Drugs used in patients undergoing coronary artery bypass surgery; ACE-I – angiotensin-converting enzyme inhibitor; ARB – angiotensin II AT1 receptor blocker

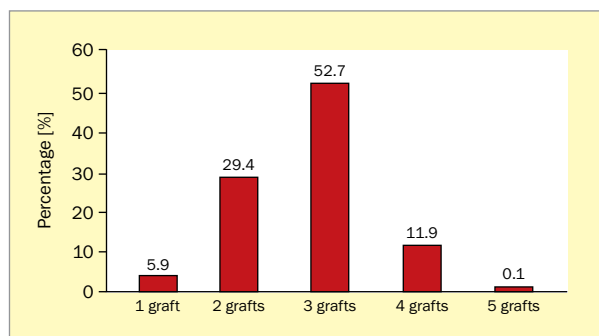


Figure 4. Number of bypass grafts implanted during coronary artery bypass grafting

anterior descending artery – in 787 patients, i.e. in 99.5% of patients (Table 3).

Postoperative complications after CABG occurred in 41% of patients. The most frequent complication observed in the postoperative period was low cardiac output syndrome, which was diagnosed in 14% of patients. Local complications occurred in 68 patients (8.6%). Retoracotomy was necessary in 69 out of 791 patients, which accounted for 8.7% of all patients.

Table 3. Bypassed coronary vessels in the study group

Bypassed vessel	Number of patients n = 791	Percentage of patients [%]
Left anterior descending artery	787	99.5
Marginal branch	537	67.9
Posterior descending artery	245	30.9
Right coronary artery	243	30.7
Diagonal branch	195	24.7
Circumflex branch	114	14.4

Discussion

The mean age of a group of 791 patients was 65 years. Patients in the present study were older than those in the studies by Zamana et al. [4], El-Chami et al. [5] and Hashemzadeh et al. [6], in which the mean age was between 57 and 63 years. Also, patients in the studies performed by Polish authors – Sobczyk et al. [7], Pastuszek et al. [8], Banach et al [9] and Dąbrowski et al. [10] – were younger than in the present study (mean age was 59–62 years). In our study, 32% of the patients were over 70 years of age and 4% of the patients were over 80 years of age. The percentage of men was 74%. According to epidemiological data, ischemic heart disease is more likely to cause death in women than in men, but multivessel coronary artery disease is more common in men [11].

In the study group, coronary artery disease was most commonly associated with hypertension, which was found in 77% of patients. Lower percentage of patients with hypertension was found in the following studies: Sedrakyan et al. [12] – 28%; Erdila et al. [13] – 36%; Thorén et al. [14] – 51%; and El-Chami et al. [5] – 72%. In all of the above-mentioned studies, except for the study of Thorén et al. [14], the patients were younger than those in our study, which may explain the lower proportion of hypertensive

subjects in these studies. In the study of Steinberg, which included 2390 patients undergoing CABG, 85% of patients were diagnosed with hypertension [15]. Hypertension was present in 68% of patients studied by Banach et al. [9] and in 73% of those included in a study performed by Dąbrowski et al. [10].

In our study, heart failure was found in 21% of patients before CABG. Banach et al. [9] reported heart failure in 4.3% of patients undergoing surgery. Horwich et al. [16] diagnosed congestive heart failure in 12% of patients and El-Chiami et al. [5] in 15.5% of patients. Differences in the incidence of heart failure in individual studies may be due to the accepted diagnostic criteria. In the study by Hashemzadeh et al. [6], heart failure defined as NYHA class \geq III was found in 50% of patients. In the study by Dąbrowski [10] and in the Swedish register [14], heart failure was diagnosed in all patients included in the study and classified as NYHA class I–IV. In this study, the mean left ventricular ejection fraction was 50.4% and was higher than that reported by Banach et al. (41%) [9] and slightly lower than the mean EF value in the study by Pastuszek et al. (54.7%) [8].

Antiplatelet drug(s) were used by 78.9% ($n = 624$) patients participating in our study. Their beneficial effects in patients undergoing CABG include reduced mortality, lower risk of myocardial infarction and stroke. Reduced incidence of cardiovascular disease is also associated with the use of beta-adrenolytics. In our study, 86.3% of patients were prescribed beta-adrenolytics. In other studies, 89% of patients [97] and 97% of patients [10] were treated with beta-adrenolytics before the CABG. Large number of patients taking angiotensin-converting enzyme inhibitors (ACE-I) in our study (91% of patients) were probably associated with a high incidence of hypertension in patients assigned to surgery and were significantly higher than that reported by other authors: Dąbrowski et al. – 64% [10]; Pastuszek et al. – 48% [8]. Meta-analysis of randomized trials on

statin use prior to CABG showed that statins significantly reduced postoperative risk of myocardial infarction. In our study, statins were administered to over 90% of patients.

The mean number of implanted bypass grafts in the examined group was 2.7 ± 0.5 and was comparable to the results of the study by Banach et al. [9] – 2.58 ± 1.64 . Both in our study and in the study by Pastuszek et al. [8], the most frequently bypassed artery was the left anterior descending coronary artery (in 99.5% and 96% of patients, respectively).

Postoperative complications after CABG occurred in 41% of patients. The most common complication was low cardiac output syndrome, occurring in 14% of patients. The percentage of patients with this syndrome in our study was higher than in the studies by other authors. Sobczyk et al. [7] showed that low cardiac output syndrome was present in 3% of patients, while in the study by Banach et al. [9] it was found in 10% of patients. The differences in the incidence of low cardiac output syndrome may be influenced by the fact that the patients in our study were older than those in the cited studies and more often had preoperative heart failure.

Conclusions

1. Men were more likely than women to undergo isolated CABG.
2. The most common group of patients undergoing isolated CABG were patients aged 60–69 years.
3. Most patients undergoing isolated CABG had hypertension.
4. Postoperative complications were observed in 41% of the patients, with the most frequent being low cardiac output syndrome.

Conflict of interest

None declared.

Streszczenie

Wstęp. Pomostowanie aortalno-wieńcowe (CABG) jest metodą leczenia choroby wieńcowej, której są poddawani pacjenci z różnymi schorzeniami współistniejącymi oraz w różnym wieku. Celem pracy była charakterystyka pacjentów poddawanych izolowanej operacji CABG.

Materiał i metody. Analizę retrospektywną objęto dokumentację medyczną chorych operowanych w Klinice Kardiologii Świątokrzyskiego Centrum Kardiologii w latach 2009–2011. Kryterium włączenia do badania stanowiła izolowana operacja CABG u pacjentów bez wywiadu migotania przedsionków przed operacją.

Wyniki. Badaniem objęto grupę 791 chorych. Mężczyźni stanowili 74,3% ($n = 588$) badanych. Średnia wieku badanych wynosiła $64,6 (\pm 9,1)$ roku. Najliczniej byli reprezentowani chorzy w wieku 60–69 lat. Nadciśnienie tętnicze występowało u 607 spośród 791 chorych (76,7% badanych). Niewydolność serca stwierdzono u 20,6% ($n = 163$) chorych poddawanych CABG. Średnia liczba wszczepianych pomostów wynosiła $2,7 \pm 0,5$. Gałąź przednią zstępującą lewej tętnicy wieńcowej pomostowano u 99,5% ($n = 787$) chorych. Powikłania w okresie pooperacyjnym po CABG dotyczyły 41% chorych.

Wnioski. Mężczyzn częściej niż kobiety poddawano izolowanemu CABG. Najliczniejszą grupę chorych poddawanych izolowanemu CABG stanowiły osoby w wieku 60–69 lat. U większości chorych poddawanych izolowanemu CABG występowało nadciśnienie tętnicze. Powikłania pooperacyjne stwierdzono u 41% operowanych, najczęściej zespół małego rzutu.

Słowa kluczowe: izolowane CABG, rewaskularyzacja, nadciśnienie tętnicze, niewydolność serca

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