Clinical efficacy of different treatments and their impacts on the quality of life of octogenarians with coronary artery disease

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Abstract

Background: Coronary artery disease (CAD) in octogenarians (age of ≥80 years) has a high risk of mortality and high medical expenses. Research shows that the prevalence of CAD is higher among octogenarians than that among younger people, but few such patients undergo percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). This study aimed to evaluate different treatments with respect to their clinical effects and impacts on quality of life of octogenarians with CAD.

Methods: Data of 519 octogenarians with CAD consecutively treated at Beijing Anzhen Hospital, Capital Medical University (Beijing, China) from January 2010 to January 2016 were collected in this study. The patients were categorized into three groups based on the treatments they received: the PCI group ($n = 292$), CABG group ($n = 110$), and medical treatment group ($n = 117$). The followings were recorded during follow-up: clinical data, death (all-cause and cardiovascular-related), re-hospitalization time, Seattle Angina Questionnaire (SAQ) score, and occurrence of hemorrhagic events (cerebral bleeding, gastrointestinal bleeding, and dermal ecchymosis).

Results: The median follow-up duration was 25.0 (25th, 75th percentile: 17.0, 55.5) months among 417 patients. The all-cause death rates (28.2% *vs.* 12.0% and 14.6%, respectively) and cardiovascular-related death rates (15.4% *vs.* 3.8% and 6.4%, respectively) were significantly higher in the medical treatment group than those in the PCI group and CABG group (all $P < 0.05$). The re-hospitalization rate for cardiovascular events was significantly lower in the CABG group than those in the PCI group and medical treatment group (3.8% *vs.* 12.8% and 14.9%, respectively) ($\chi^2 = 8.238$, $P = 0.018$). The SAQ scores of physical limitation, angina frequency, treatment satisfaction, and disease perception were significantly higher in the PCI group and CABG group than those in the medical treatment group (all $P < 0.05$). No significant difference in the angina stability score was observed among the three groups ($F = 3.179$, $P = 0.204$).

Conclusion: PCI and CABG result in reduced mortality and better quality of life in octogenarians with CAD.

Keywords: Coronary artery disease; Octogenarian; Percutaneous coronary intervention; Coronary artery bypass graft; Death; Life quality

Introduction

Coronary artery disease (CAD) is one of the most common chronic diseases among people of advanced age.[1] The society of China is aging, and the number of patients of advanced age who develop CAD increases every year. The current treatments for CAD mainly include percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), and medical treatment. Because of the high proportion of coronary artery calcification, left main artery (LM) lesions, congestive heart failure,[2] pulmonary edema, and cardiogenic shock, octogenarians (age of ≥80 years) with CAD have not been adequately represented in randomized trials comparing CABG and PCI, the most appropriate method of revascularization for this group of patients has not been determined; therefore, their treatment options are usually limited.[3] This study was performed to analyze the clinical effect of different treatments on octogenarians with CAD and their resulting quality of life.

Methods

Ethical approval

This study was approved by the Institutional Review Board of the Ethics Committee of Beijing Anzhen Hospital, Capital Medical University. The study was performed in accordance with the *Declaration of Helsinki*. Informed consent was obtained from all the patients.

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Study population

This study was conducted from January 2010 to January 2016 and included 519 octogenarians with CAD (age range, 80.0–92.0 years) from Beijing Anzhen Hospital, Capital Medical University (Beijing, China). Patients were included if they were found to have ≥50% stenosis in at least one epicardial coronary artery at the time of angiography, such as the LM, left anterior descending artery, left circumflex artery, or right coronary artery or its main branch.

The inclusion criteria were an age of ≥80.0 years, satisfaction of the diagnostic criteria for CAD developed by the Chinese Society of Cardiology of the Chinese Medical Association, ≥50% diameter stenosis of at least one major coronary artery (LM, left anterior descending artery, left circumflex artery, or right coronary artery or its major large branch) as indicated by coronary angiography, and complete medical records.

The exclusion criteria were an age of <80.0 years, a history of CABG surgery, the presence of other diseases requiring cardiac surgery, severe infection, malignant tumors, a platelet count of $<100 \times 10^9$/L at admission, a hemoglobin level of <120 g/L for men and <110 g/L for women at admission, contraindications to taking anti-platelet drugs, and failure to receive PCI therapy and conversion to CABG therapy or medical treatment.

Study design

This was a retrospective cohort study. The patients were categorized into three groups based on the treatment they received: the PCI group ($n = 292$), CABG group ($n = 110$), and medical treatment group ($n = 117$).

In the PCI group, the transradial approach or transfemoral approach was selected based on the patient's condition. The target lesions were treated by either percutaneous transluminal coronary angioplasty before implantation of the drug-eluting stent or percutaneous transluminal coronary angioplasty only. All the patients achieved thrombolysis in myocardial infarction grade 3 flow after the procedure. All the patients underwent long-term treatment with aspirin and statins and at least 1 year of treatment with clopidogrel.

In the CABG group, on-pump or off-pump CABG was performed with or without cardiopulmonary bypass support. Five days before surgery, the patients were given low-molecular-weight heparin via subcutaneous injection instead of aspirin and clopidogrel. After the operation, all patients took aspirin, statins, and clopidogrel for at least 1 year.

In the medical treatment group, the patients continued to take aspirin and statins.

Telephone follow-ups were conducted for at least 1 year. Indicators of all-cause death, cardiovascular-related death, re-hospitalization associated with cardiovascular events (including angina, acute myocardial infarction [MI], and heart failure), and the Seattle Angina Questionnaire (SAQ) score at 1 year after discharge were recorded.

Measurements and endpoints

General data including sex, age, body mass index, glycosylated hemoglobin level, low-density lipoprotein cholesterol level, high-density lipoprotein cholesterol level, smoking habits, hypertension,[4] diabetes,[5] occurrence of cerebral infarction and MI, and history of PCI were collected during admission. The left ventricular ejection fraction, left ventricular end-diastolic diameter, and coronary angiography data were recorded during hospitalization.

The primary endpoint was cardiovascular-related death during the follow-up period. The secondary endpoints were all-cause death, re-hospitalization due to cardiovascular events (angina, acute MI, and heart failure), and hemorrhagic events.

SAQ score

The SAQ is scored by assigning each response an ordinal value, beginning with 1 for the response that implies the lowest level of functioning, and summing across items within each of the five scales. The score for each scale is then transformed to a score from 0 to 100 by subtracting the lowest possible scale score, dividing by the range of the scale, and multiplying by 100. Because each scale monitors a unique dimension of CAD, no summary score is generated.

The physical limitation (PL) scale (question 1) measures how daily activities are limited by symptoms of CAD. Specific activities were chosen to minimize differences among socioeconomic classes and sex. The anginal stability (AS) scale (question 2) assesses the change in the frequency of angina at patients' most strenuous level of activity. The anginal frequency (AF) scale (questions 3 and 4) is modified from the angina questionnaire established by Peduzzi and Hultgren.[6] This scale measures the frequency of angina pectoris attacks. The treatment satisfaction (TS) scale (questions 5 to 8) quantifies patients' satisfaction with their current treatment. Finally, the disease perception (DP) scale (questions 9–11) characterizes the burden of CAD on patients' quality of life.

To improve the response rate, the SAQ is brief and self-administered, requiring <5 min to complete. This helped to improve the response rate in this study. Additionally, it is designed in a machine-readable format to permit fast, easy, and inexpensive data entry, and it can supplement a broader assessment of functional status, such as the Short Form-36.[7] The SAQ score has been shown to be reliable in a previous study.[8] This questionnaire was used in the present study to evaluate the specific functional status and quality of life in patients with CAD at 1 year after discharge.

Statistical analyses

Data are expressed as mean ± standard deviation or median (25th, 75th percentile) depending on the data distribution and were analyzed using one-way analysis of variance. Non-normally distributed continuous variables are presented as the median value of the interquartile range and were analyzed using the Kruskal-Wallis test. Categorical variables were tested using the Chi-square test or the

Table 1: Clinical characteristics and follow-up time in octogenarians with coronary artery disease undergoing different treatments.

Characteristics	CABG group ($n=110$)	PCI group ($n=292$)	Medical treatment group ($n=117$)	Statistics	P
Age (years)	81.2 ± 1.7	81.5 ± 1.9	82.0 ± 2.4[‡]	4.719[*]	0.031
Male	85 (77.3)	191 (65.4)	77 (65.8)	5.500[†]	0.064
Body mass index (kg/m^2)	24.46 ± 3.12	24.96 ± 3.27	24.45 ± 3.44	0.216[*]	0.642
Hypertension	80 (72.7)	199 (68.2)	86 (73.5)	1.532[†]	0.465
Diabetes	37 (33.6)	102 (34.9)	29 (24.8)	4.029[†]	0.133
Previous MI	30 (27.3)	101 (34.6)	29 (24.8)	4.592[†]	0.101
Previous cerebral infarction	18 (16.4)[§]	24 (8.2)	18 (15.4)[§]	7.344[†]	0.025
Previous PCI	24 (21.8)	83 (28.4)	36 (30.8)	2.530[†]	0.282
Smoke	34 (30.9)	102 (34.9)	37 (31.6)	0.780[†]	0.677
LDL-C (mmol/L)	2.42 ± 0.78	2.35 ± 0.80	2.50 ± 0.80	1.411[*]	0.245
HDL-C (mmol/L)	1.02 ± 0.27	1.07 ± 0.24	1.17 ± 0.97	2.355[*]	0.096
Follow up time (months)	24.0 (17.0, 52.0)	23.0 (16.0, 50.0)	40.0 (21.0, 57.0)[‡,§]	15.249[‖]	<0.001
Access rate	85 (80.2)	238 (82.4)	94 (82.5)	0.273[†]	0.872

Data are presented as n (%), mean ± standard deviation, or median (interquartile range). [*] One-way analysis of variance. [†] Pearson's Chi-square test. [‡] $P<0.05$, compared with CABG group. [§] $P<0.05$, compared with PCI group. [‖] Kruskal-Wallis test. CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention; MI: Myocardial infarction; LDL-C: Low-density lipoprotein cholesterol; HDL-C: High-density lipoprotein cholesterol.

Fisher exact test. An unconditional logistic regression model adjusted for sex, age, lesion count, LM lesion involvement, type of disease, and previous cerebral infarction was used to compare the mortality rates at 1, 2, and 3 years after treatment. All statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC, USA). A P value of <0.05 (two-tailed) was considered statistically significant.

Results

General information

Of the 519 patients aged 80.0 to 92.0 years in this study, 10 died in the hospital and 92 were lost to follow-up after discharge. The follow-up rate was 81.9%, and the median follow-up time was 25.0 (17.0, 55.5) months. Among the three groups, 51 (17.6%) patients in the PCI group, 21 (19.8%) in the CABG group, and 20 (17.5%) in the medical treatment group were lost to follow-up. There was no significant difference in the rate of loss to follow-up among the three groups ($\chi^2=0.273$, $P=0.872$).

There were no significant differences in age, sex, smoking history, body mass index, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, hypertension, diabetes, previous MI, previous cerebral infarction, or history of PCI among the three groups [Table 1]. The mean follow-up time in the medical treatment group was significantly longer than those in the PCI group and CABG group ($P<0.001$). Because of the large time span of sample acquisition in this study, the patients in the medical treatment group were usually the earliest to receive treatment. The development of revascularization technology and accumulation of experience gained by health providers have resulted in the adoption of revascularization therapy over traditional coronary angiography as the primary method for treating patients with CAD.

The proportions of diagnoses of CAD showed significant differences among the three groups [Table 2]. The proportion of unstable angina in the CABG group was 89.1%, which was much higher than those in the PCI group (71.6%) and medical treatment group (75.2%). The proportions of acute ST-segment elevation MI and acute non-ST-segment elevation MI in the PCI group were 14.4% and 12.7%, respectively, and were significantly higher than those in the CABG group (7.3% and 3.6%, respectively) and medical treatment group (10.3% and 5.1%, respectively). The proportion of stable angina in the medical treatment group was 9.4%, which was much higher than that in the PCI group (1.4%) [Table 2].

Comparison of coronary angiography data

The proportions of triple lesions and LM lesions in the CABG group were significantly higher than those in the PCI and medical treatment groups ($\chi^2=60.891$, $P<0.001$; $\chi^2=22.183$, $P<0.001$). There were no significant differences in calcification lesions, long lesions (>20 mm), small vessel disease (lumen of <3 mm), the left ventricular ejection fraction, or the left ventricular end-diastolic diameter among the three groups [Table 2].

Comparison of hemorrhagic events and deaths during hospitalization

There were no significant differences in bleeding events or death during hospitalization among the three groups ($\chi^2=1.117$, $\chi^2=3.203$, all $P>0.05$) [Tables 3 and 4].

Comparison of outcomes during follow-up

The all-cause ($\chi^2=16.474$, $P<0.001$) and cardiovascular-related death rates ($\chi^2=17.535$, $P<0.001$) were significantly higher in the medical treatment group than those in the PCI group and CABG group [Table 4]. With respect to cardiovascular-related death at 1 year, the odds ratio was 0.280 (0.118–0.660) for the PCI group and 0.543 (0.185–1.589) for the CABG group, compared with

Table 2: Comparison of classification of CAD, lesion characteristics and cardiac function in octogenarians with coronary artery disease undergoing different treatments.

Characteristics	CABG group ($n=110$)	PCI group ($n=292$)	Medical treatment group ($n=117$)	Statistics	P
Classification of CAD				39.434*	<0.001
Acute non-ST-segment elevation MI	4 (3.6)§	37 (12.7)	6 (5.1)§		
Stable angina	0	4 (1.4)	11 (9.4)‡,§		
Acute ST-segment elevation MI	8 (7.3)§	42 (14.4)	12 (10.3)§		
Unstable angina	98 (89.1)	209 (71.6)‡	88 (75.2)‡		
Lesion count				75.165*	<0.001
Single	4 (3.6)	63 (21.6)	40 (34.2)		
Double	17 (15.4)	117 (40.1)	29 (24.8)		
Triple	89 (80.9)	112 (38.4)‡	48 (41.0)‡	60.891*	<0.001
Involving LM	31 (28.2)	30 (10.3)‡	13 (11.1)‡	22.183*	<0.001
Calcification	32 (29.1)	83 (28.4)	35 (29.9)	0.093*	0.955
Lesion length				1.325*	0.516
>20 mm	29 (26.4)	74 (25.3)	24 (20.5)		
≤20 mm	81 (73.6)	218 (74.7)	93 (79.5)		
Lesion lumen diameter				0.403*	0.817
≥3 mm	93 (84.6)	254 (87.0)	101 (86.4)		
<3 mm	17 (15.4)	38 (13.0)	16 (13.7)		
LVEF (%)	59.96 ± 8.49	60.64 ± 9.83	60.88 ± 10.88	0.267†	0.459
LVEDD (mm)	47.95 ± 5.64	47.58 ± 6.22	48.27 ± 6.34	0.506†	0.318

Data are shown as *n* (%) or mean ± standard deviation. * Pearson Chi-square test. † One-way analysis of variance. ‡ $P < 0.05$, compared with CABG group. § $P < 0.05$, compared with PCI group. CAD: Coronary artery disease; CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention; MI: Myocardial infarction; LM: Left main stem; LVEF: Left ventricular ejection fraction; LVEDD: Left ventricular end-diastolic diameter.

Table 3: Comparison of hemorrhagic events and re-hospitalization in octogenarians with coronary artery disease undergoing different treatments.

Characteristics	CABG group ($n=110$)	PCI group ($n=292$)	Medical treatment group ($n=117$)	Statistics†	P
Hemorrhagic events	3 (2.7)	16 (5.5)	3 (2.6)	2.535	0.282
During hospitalization	0	3 (1.0)	1 (0.8)	1.117	0.572
After discharge*	3 (2.7)	13 (4.5)	2 (1.8)	2.106	0.349
Cerebral hemorrhage	1 (0.9)	1 (0.4)	0	1.253	0.535
Gastrointestinal bleeding	1 (0.9)	2 (0.7)	1 (0.9)	0.066	0.967
Dermal ecchymosis	1 (0.9)	10 (3.5)	1 (0.9)	3.659	0.160
Re-hospitalization for cardiovascular events*	4 (3.8)	37 (12.8)‡	17 (14.9)‡	8.238	0.018

Data are shown as *n* (%). * Ten deaths occurred during hospitalization. † Pearson Chi-square test. ‡ $P < 0.05$, compared with CABG group. CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention.

the medical treatment group (reference group) [Table 5]. Similar results were observed for the 2- and 3-year cardiovascular-related death rates [Table 5]. The re-hospitalization rate for cardiovascular events was significantly lower in the CABG group than those in the PCI group and medical treatment group ($\chi^2 = 8.238$, $P = 0.018$) [Table 3]. The PL, AF, TS, and DP scores in the SAQ were significantly higher in the PCI group and CABG group than those in the medical treatment group (all $P < 0.05$) [Table 6]. No significant differences in the AS scores were observed among the three groups ($F = 3.179$, $P = 0.204$) [Table 6].

Discussion

This retrospective study was designed to evaluate the effect of different revascularization treatments on Chinese octogenarians with CAD. We found that the PCI and CABG groups had significantly lower all-cause and cardiovascular-related death rates and higher scores in four domains of the SAQ scale compared with the medical treatment group. The re-hospitalization rate for cardiovascular events was significantly lower in the CABG group than in the PCI group and medical treatment group. These findings provide important information on the treatment of CAD in octogenarians and highlight the need to re-evaluate the approach to individualized treatment.[9]

This study showed that cardiovascular mortality was significantly lower in the PCI and CABG groups than in the medical treatment group, while no significant difference was observed between the PCI and CABG groups. This suggests a longer survival time among octogenarians with CAD undergoing PCI and CABG treatment; however,

Table 4: Comparison of death rate of octogenarians with coronary artery disease undergoing different treatments after a 1-year follow-up.

Characteristics	CABG group ($n = 110$)	PCI group ($n = 292$)	Medical treatment group ($n = 117$)	Statistics*	P
Time points of death					
During hospitalisation	4 (3.6)	3 (1.0)	3 (2.6)	3.203	0.202
After discharge	12 (10.9)	32 (11.0)	30 (25.6)†,‡	16.009	<0.001
Total death	16 (14.6)	35 (12.0)	33 (28.2)†,‡	16.474	<0.001
Non-cardiovascular-related	9 (8.2)	24 (8.2)	15 (12.8)	2.296	0.317
Cardiovascular-related	7 (6.4)	11 (3.8)	18 (15.4)†,‡	17.535	<0.001

Data are shown as *n* (%). * Pearson Chi-square test. † $P < 0.05$, compared with CABG group. ‡ $P < 0.05$, compared with PCI group. CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention.

Table 5: Death rates at 1, 2, and 3 years in octogenarians with coronary artery disease after undergoing different treatments.

Characteristics	CABG group ($n = 110$)	PCI group ($n = 292$)	Medical treatment group ($n = 117$)	Statistics	P	Adjusted P*
Follow-up for 1 year	107	283	115			
Cardiovascular-related death	5 (4.7)	5 (1.8)	12 (10.4)‡,§	8.470†	0.004	0.014
OR (95% CI)	0.280 (0.118–0.660)	0.543 (0.185–1.589)	1.000			
Follow-up for 2 years	65	142	101			
Cardiovascular-related death	6 (9.2)	8 (5.6)	15 (14.9)‡,§	12.934†	<0.001	0.002
OR (95% CI)	0.184 (0.072–0.467)	0.406 (0.134–1.228)	1.000			
Follow-up for 3 years	47	99	80			
Cardiovascular-related death	7 (14.9)	8 (8.1)	18 (22.5)‡,§	17.146†	<0.001	<0.001
OR (95% CI)	0.149 (0.060–0.370)	0.399 (0.141–1.124)	1.000			

Data are shown as *n* or *n* (%). * An unconditional logistic regression model was used to adjust for sex, age, lesion count, coronary trunk involvement, disease type, and previous cerebral infarction(s). † Pearson Chi-square test. ‡ $P < 0.05$, compared with CABG group. § $P < 0.05$, compared with PCI group. CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention; OR: Odds ratio; CI: Confidence interval.

Table 6: SAQ scores of octogenarians with coronary artery disease undergoing different treatments.

Items	CABG group ($n = 69$)	PCI group ($n = 191$)	Medical treatment group ($n = 38$)	Statistics*	P
Disease perception	66.67 (58.33, 75.00)	66.67 (50.00, 75.00)	54.17 (33.33, 75.00)†,‡	7.685	0.021
Treatment satisfaction	88.24 (70.59, 94.12)	82.35 (70.59, 94.12)	70.59 (58.82, 88.24)†,‡	9.337	0.009
Angina frequency	90 (70, 100)	80 (60, 100)	60 (40, 90)†,‡	10.769	0.005
Angina stability	50 (25, 100)	50 (25, 100)	50 (25, 50)	3.179	0.204
Physical limitation	44.44 (31.11, 63.33)	46.67 (35.56, 57.78)	38.89 (31.11, 46.67)†,‡	8.026	0.018

Data are shown as median (interquartile range). * Kruskal-Wallis test. † $P < 0.05$, compared with CABG group. ‡ $P < 0.05$, compared with PCI group. SAQ: Seattle Angina Questionnaire; CABG: Coronary artery bypass grafting; PCI: Percutaneous coronary intervention.

there is no clear reason to recommend one revascularization method over the other. This finding is consistent with previous reports based on other study populations, such as one Canadian cohort study.[10] Octogenarians usually have severe coronary artery lesions that lead to increased complexity of surgery and vascular complications,[11] and this underscores the importance of revascularization. For some patients who have developed ischemic cardiomyopathy and impaired cardiac function, revascularization might be an effective treatment that will improve their quality of life and prolong their survival time.

Although no significant difference was observed in all-cause or cardiovascular-related mortality between the PCI and CABG groups, we noticed that patients in the CABG group had higher ratios of LM lesions and multiple coronary artery lesions than the other two groups; this is consistent with previously established guidelines that recommend CABG treatment for patients with multiple lesions or LM lesions.[12] This study also suggests that PCI might easily be administered to such patients. However, further studies are needed to investigate its effects on the long-term prognosis.

Furthermore, we found that patients in the CABG group had a significantly lower proportion of re-hospitalization due to cardiovascular events than patients in the other two groups. Considering that the CABG group received complete revascularization while the PCI group received only partial revascularization, this finding is not consistent with previous reports.[13] This might be attributed to the characteristics of the study participants.

It has been demonstrated that the dual anti-platelet regimen required for revascularization in octogenarians is safe and effective.[12] The results of this study indicated no significant differences in the rates of cerebral hemorrhage, gastrointestinal bleeding, or skin ecchymosis between the patients who received dual anti-platelet therapy along with PCI or CABG treatment and the patients who received drug therapy only; this further confirms the safety of dual anti-platelet therapy and supports the findings of previous studies. One other study based on a registry database suggested that the risk of PCI in octogenarians with CAD gradually decreased with the application of radial artery intervention,[12,14,15] administration of drugs such as bivalirudin, and use of second-generation drug-eluting stents.[16] The safety and efficacy of statins in octogenarians were confirmed in a previous study,[17] but were not shown to significantly impact the prognosis.[18] Currently, drug therapy is the main treatment for octogenarian patients with CAD in China.[19] With increased reports on the safety and efficacy of revascularization in octogenarians, it is possible to change the course of treatment in the upcoming years and improve the prognosis of CAD.

The percentage of patients with acute MI (including ST-segment elevation MI and non-ST-segment elevation MI) was significantly higher in the PCI group than in the other two groups, which may be due to increased cases of emergency PCI procedures in the octogenarian population than in the general population. It also indicates that octogenarians may benefit from emergency interventional treatment.[20]

The results of this study show that patients in the PCI and CABG groups had significantly higher scores in four dimensions (PL, AF, TS, and DP) of the SAQ scale than those in the medical treatment group. The findings suggest that patients who underwent either of the two revascularization treatments had better quality of life than those who underwent drug therapy alone. However, there was no significant difference in AS among the three groups. Future studies with larger sample sizes are needed to increase the statistical power.

This study has some limitations. First, because of incomplete information on the specific imaging materials, we only analyzed data for patients with available imaging reports and written reports. Second, the observed drug regimen was limited to aspirin and statins. Third, there were differences in the proportions of diagnoses among the three groups because patients with CAD may also have angina pectoris, MI, and multiple other comorbidities. Finally, because of the particularity of the patient population, patients were lost to follow-up at an abnormally high rate. Therefore, additional studies may be needed to confirm our findings.

In conclusion, this study suggests that compared with medical treatment, PCI and CABG can improve the survival rate and quality of life in octogenarians with CAD. An active revascularization treatment program is feasible and might be administered in clinical settings. Nevertheless, treatment regimens need to be more individualized, such as to patients with LM lesions.

Conflicts of interest

None.

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