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Original Article

Curative effect of PCI and CABG on left main coronary artery lesions

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Abstract: Coronary atherosclerotic heart disease (CHD) is the most common type of cardiovascular disease with increased incidence and serious damage to human life and health. Left main coronary artery lesions lead to severe ischemic symptoms, including ventricular fibrillation, cardiac shock, cardiac arrest, and even death. At present, two kinds of intervention such as percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) could be used for treatment. Comparison of their effects is still under investigation. 462 cases of patients who were diagnosed as left main coronary artery disease and received blood reconstruction surgery in our hospital between Jan 2009 and Dec 2012 were retrospectively analyzed. 270 cases were treated by PCI combined drug-coated stents, and 192 cases received CABG therapy. Parsonnet score and Karnofsky score were compared. Target lesion revascularization rate, incidence of myocardial infarction, adverse cerebrovascular events (MACCE), mortality, and curative effect were evaluated. No statistical difference was observed in Parsonnet score ($P > 0.05$). Follow-up analysis found PCI group has higher rate of target lesion revascularization, incidence of angina pectoris, incidence of MACCE than CABG group, whereas lower Karnofsky score ($P < 0.05$). Myocardial infarction and fatality rate were similar between two groups. In conclusion, our study showed that PCI and CABG showed similar curative effect for the treatment of left main coronary artery lesions, while CABG presented better long-term curative effect.

Keywords: Coronary heart disease, left main coronary artery lesion, PCI, CABG

Introduction

Following economy development and living habits changes, multiple factors such as diet and stress increased the incidence of cardiovascular disease year by year. Cardiovascular disease has a high morbidity and mortality that is harm to people's life. It is the main disease affecting the quality of life and becomes an important public health problem [1, 2]. As the most common type of cardiovascular disease, coronary atherosclerotic heart disease (CHD) is caused by inflammation and smooth muscle cells dysfunction. It further leads to endothelial damage, resulting in lipid deposition in the intimal of coronary artery, chemotaxis macrophage phagocyte to form atheromatous plaque that causes luminal stenosis and even blocked [3]. Main clinical symptoms of CHD include arrhythmia, angina pectoris, myocardial infarction, and heart failure, etc. [4]. Two-thirds of the heart blood supply is provided by the left main coronary artery. More than 50% stenosis in left main coronary artery is known as the left main disease. Left main coronary artery lesions lead to severe ischemic symptoms, ventricular fibrillation, cardiac shock, cardiac arrest, and even death [5, 6]. Left main disease could be divided into two categories: protective left main disease, as the heart exists good collateral circulation or unobstructed blood vessel bridge from right to left; And unprotected left main disease, that is, without collateral circulation or grafts bridge [7]. Of which unprotected left main disease has the worst prognosis in cardiovascular disease [8]. Thus, study on the treatment of left main coronary artery lesions became a hot spot in the field of clinical cardiovascular disease.

At present, establishing effective revascularization is the main treatment for left main coronary artery disease. The treatment mainly includes percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) [9]. CABG is the first technique applied in the treatment of left main coronary artery lesions,

as to prevent stent thrombosis, restenosis, or infarction [10, 11]. PCI can dilate coronary artery stenosis via percutaneous puncture catheterization technique, achieving the goal of improving cardiac hemodynamic [12, 13]. Following the development of extracorporeal circulation technology, PCI combined drug-eluting stents are widely used in the left main coronary artery lesions [14]. Though PCI and CABG both were used in the left main coronary artery lesions treatment, their curative effect is still controversy. This study intended to clarify the better therapy for left main coronary artery lesions through retrospectively analyzing the effect of PCI and CABG.

Materials and methods

Research object

462 cases of patients diagnosed as left main coronary artery disease and received blood reconstruction surgery in Beijing Military Region General Hospital between Jan 2011 and Dec 2014 were retrospectively analyzed. 270 cases were treated by PCI combined drug-coated stents including 195 males and 75 females with average age at 63±7.2 (43-82) years old, and 192 cases received CABG therapy including 135 males and 57 females with mean age at 63±8.5 (41-85) years old. All patients were diagnosed as unprotected left main coronary artery lesions by coronary angiography. Exclusion criteria includes suffered from cerebrovascular disease; valve replacement; PCI or CABG surgery history, or aortic surgery history; Severe liver and kidney failure; congenital heart disease; accompanied by blood system diseases; malignant tumor; systemic autoimmune, infectious or contagious disease; patients with incomplete follow-up; died due to accident; patients with incomplete clinical data.

The study protocol was approved by the Research Ethics Committee of Beijing Military Region General Hospital, and all patients gave their informed consent before study commencement.

Methods

Surgical method: PCI group patients received 300 mg aspirin and 300 mg clopidogrel before operation. 8000 U heparin was used after imbedding drug-coated stents. Residual stenosis less than 20% after vascular reconstruction, TIMI flow reached grade 3, no clinical complications were considered as success. The patients received 300 mg aspirin after surgery for 1 month, and then changed to 100 mg aspirin for long time. 75 mg/d clopidogrel was also used for 12 months.

CABG group patients were routinely given 100 mg aspirin or 75 mg/d chloride before operation. The operation plan was determined according to the pathological change. In general, hand LAD was built to the left internal mammary artery, and the great saphenous vein was built to LCX and/or RCA. Statin, ACEI, and β-receptor antagonist were applied postoperatively.

Clinical information

General clinical information including gender, age, height, cardiac function indexes, and related risk factors including smoking, obesity, hypertension, and diabetes were collected. Biochemical criterion including blood glucose, blood fat, liver and kidney function were also gathered.

Parsonnet score

Parsonnet score was evaluated according to patients' age, gender, obesity, coronary heart disease risk factors, preoperative heart function, and operation condition. It was higher than 15 points in high-risk patients and lower than 15 points in low-risk patients [15].

Follow-up

All the patients were follow-up for related information including nonfatal myocardial infarction, cerebrovascular events, MACCE events, and target lesion revascularization (TLR).

Karnofsky score

Karnofsky score was graded based on physical power and functional status [16]. Higher score represented better physical condition.

Statistical analysis

All statistical analysis was performed by SPSS16.0 software. Measurement data was presented as mean ± standard deviation Mean ± SD). One-way ANOVA, t test, and chi-square test were used for data comparison. $P < 0.05$ was considered as statistically significant.

Table 1. General information

Index	PCI group (n=270)	CABG group (n=192)	*P* value
Age	63±7.2	61±8.5	0.371
Gender (female)/n (%)	75 (27.78)	57 (29.69%)	0.796
Duration of chest pain	21.19±12.19	21.28±11.76	0.951
Chest pain/n (%)	258 (95.6)	183 (95.3)	1.0
Left ventricular end-diastolic diameter (mm)	51±9.72	50±8.97	0.632
LVEF (%)	56.27±7.42	57.32±6.98	0.598

Table 2. Preoperative CHD risk factors analysis

Index	PCI group (n=270)	CABG group (n=192)	*P* value
Obesity/n (%)	126 (46.7)	108 (56.3)	0.241
Smoking/n (%)	84 (31.1)	30 (18.62%)	0.084
Hypertension/n (%)	96 (35.6)	63 (32.79%)	0.72
Dyslipidemia/n (%)	165 (61.1)	120 (62.5%)	0.86
Diabetes/n (%)	153 (56.7)	90 (46.92%)	0.232

Table 3. Biochemical criterion

Parameter	PCI group (n=270)	CABG group (n=192)	*P* value
Fasting blood glucose (mmol/L)	5.21±2.91	5.10±2.75	0.81
CK (IU/L)	152.98±161.44	172.18±152.76	0.540
UA (μmol/L)	379.06±133.16	377.77±112.77	0.948
APTT(s)	34.34±5.87	34.26±5.79	0.91
LDH (IU/L)	134.53±171.19	126.79±138.99	0.76
CK-MB (IU/L)	11.28±13.19	11.22±12.98	0.975

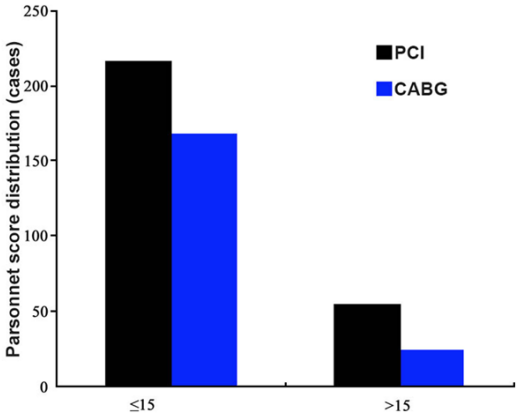

Figure 1. Parsonnet score distribution comparison between PCI and CABG.

Results

General information analysis

No significant difference was found in gender, age, duration of chest pain, and chest pain cases number between two groups (P < 0.05). Further cardiac function analysis showed that there was no statistical difference in left ventricular end-diastolic diameter and left ventricular ejection fraction (LVEF) (P > 0.05, **Table 1**).

Preoperative CHD risk factors analysis

Risk factors analysis showed that there was no difference in obesity, smoking history, hypertension, dyslipidemia, and diabetes (P > 0.05, **Table 2**).

Biochemical criterion analysis

No markedly difference was observed when comparing biochemical criterion in two groups, including fasting blood glucose, CK, UA, APTT, LDH, and CK-MB (P > 0.05, **Table 3**).

Parsonnet score comparison

Parsonnet score grading was performed based on basic clinical information, CHD risk factors, preoperative cardiac function, PCI and CABG operation. It was showed that patients' distribution in Parsonnet score ≤ 15 points and > 15 points were similar (P > 0.05, **Figure 1**). The above results revealed that two groups have similar clinical information, CHD risk factors, biochemical criterion, and Parsonnet score.

Short-term efficacy comparison

Length of stay showed no statistical significance between two groups (P > 0.05, **Figure 2**). No cases appeared acute myocardial infarction, MACCE, death during hospitalization, suggesting that PCI and CABG presented similar efficacy for left main coronary artery lesions treatment.

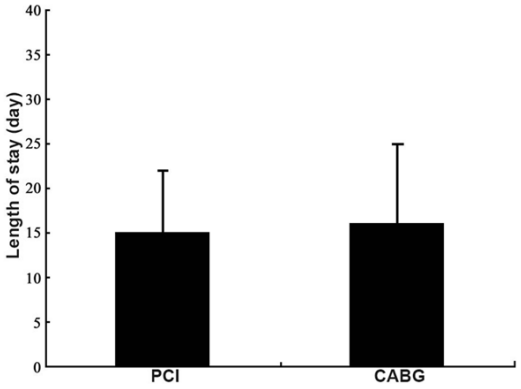

Figure 2. Length of stay comparison between PCI and CABG.

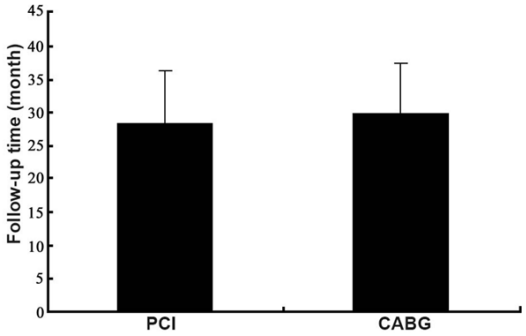

Figure 3. Follow-up time comparison between PCI and CABG group.

Long-term efficacy comparison

Two groups showed similar follow-up time ($P > 0.05$, **Figure 3**). KPS score was performed on adverse reaction, including myocardial infarction, angina recurrence rate, target lesion revascularization rate, and MACCE. Patient's quality of life and fatality rate were also recorded. Two groups had no difference in myocardial infarction and fatality rate ($P > 0.05$). However, PCI group presented higher angina recurrence rate, target lesion revascularization rate, and MACCE than CABG group (**Figure 4**). Karnofsky score in PCI group was significantly lower than that in CABG group ($P < 0.05$, **Figure 5**). It indicated that CABG showed better long-term efficacy for left main coronary artery lesions.

Discussion

Left main coronary artery stenosis is mainly caused by atherosclerosis. Left main coronary artery lesions are usually worse than common CHD. Unprotected left main coronary artery lesion can cause significantly higher fatality rate due to severe stenosis [17]. Though drug therapy has certain efficacy, its long-term curative effect is poor. Coronary arterial blood reconstruction is the fundamental measure [18, 19]. CABG and PCI combined with auxiliary medicine have been considered to be the first choice for unprotected left main lesion [11, 12]. CABG was thought to be the first choice for unprotected left main lesion in early stage [20]. However, for PCI mainly used metal stents for blood supply reconstruction, it is easy to cause recurrent myocardial infarction, vascular restenosis, thrombosis, and even death in early stage. Thus, it is listed as the taboo treatment for left main coronary artery lesions. With the development of interventional techniques, drug-eluting stents in PCI can significantly reduce the incidence of restenosis, thus reduce the risk of PCI in the treatment of left main coronary artery disease [21, 22]. At the same time, the advantages of interventional treatment can be comparable to surgical CABG, making them to be widely used in clinical treatment. Research reported that PCI operation can quickly relieve the patients' pain and improve myocardial blood supply that is suitable for patients with acute onset, while CABG is suitable for complex lesions or serious disease. However, it is still controversial about their superiority-inferiority in the treatment of left main coronary artery lesions [23, 24].

Therefore, we retrospectively analyzed the unprotected left main coronary artery lesions patients who received blood reconstruction, to compare the curative efficacy of PCI and CABG. We compared the basic clinical information and found that there was no statistical difference in gender, age, duration of chest pain, and chest pain cases number, which is consistent with previous reports [25]. No significant difference between two groups was observed in other information including biochemical criterion, symptoms before onset, and cardiac index. It suggested that the patients in two groups had similar cardiac function without obvious liver and kidney dysfunction. Other CHD risk factors such as obesity, smoking history, hypertension, dyslipidemia, and diabetes showed no markedly difference between two groups. Parsonnet score also presented no significant difference, indicating that the preoperative condition did

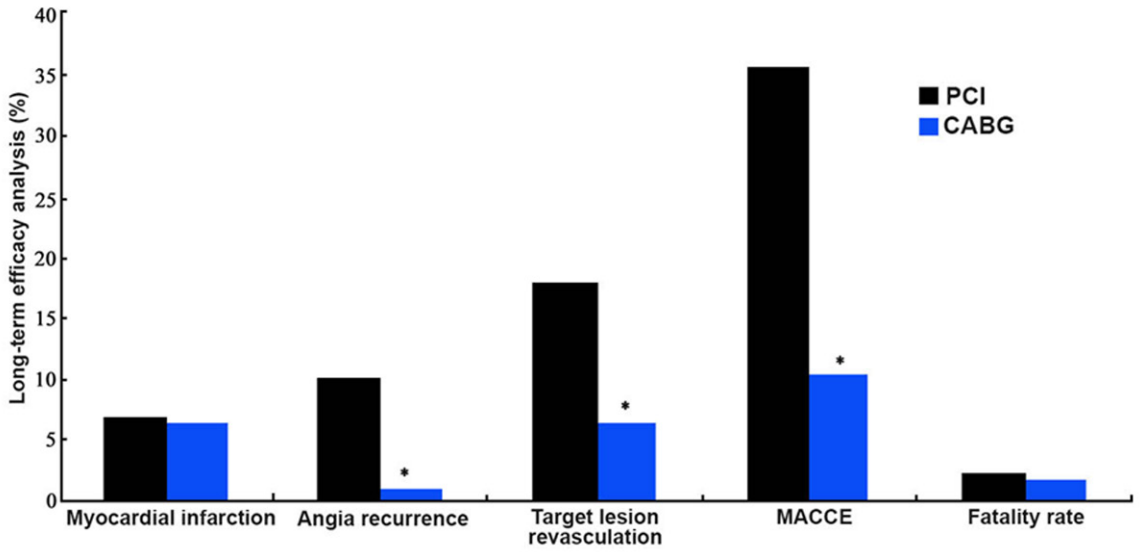

Figure 4. Long-term efficacy comparison between PCI and CABG group. *$P < 0.05$, compared with PCI group.

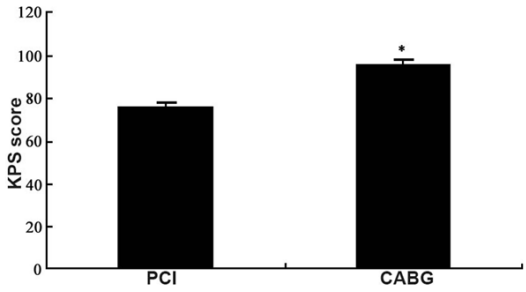

Figure 5. KPS score comparison between PCI and CABG group. *$P < 0.05$, compared with PCI group.

not affect the efficacy of PCI and CABG. Short-term efficacy analysis demonstrated that no patients occurred to acute myocardial infarction, MACCE, or death, revealing PCI and CABG had similar short-term efficacy. Further analysis of long-term efficacy for more than two years' follow-up showed that myocardial infarction in two groups had no statistical difference. Based on various sample size and follow-up time, fatality rate of PCI and CABG treatment was controversial [21]. Our results showed that the two groups presented similar fatality rate. However, PCI group presented higher target lesion revascularization rate, incidence of angina pectoris, and incidence of MACCE than CABG group. Up to now, there was still no report about Karnofsky score in PCI and CABG-based treatment on left main coronary artery lesions, while our study confirmed that Karnofsky score in PCI group was lower than that in CABG group. We aimed to enlarge sample size and elongate follow-up time in the future to clarify the efficacy difference between two therapies.

In conclusion, this study confirmed that PCI and CABG had similar short-term efficacy in treating left main coronary artery lesions, whereas CABG showed better long-term efficacy than PCI. It provided reference for clinical surgery selection in treating left main coronary artery lesions.

Disclosure of conflict of interest

None.

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