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Original Article

One year follow-up of unprotected left main coronary artery disease, a prospective cohort study of 139 patients

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Abstract

Objectives: Coronary artery revascularization is the standard treatment for patients with severe left main coronary artery disease (LMCAD). In cases where the patient refuses surgical revascularization or PCI, medical treatment will be the only option. The purpose of this study was to compare the one-year outcomes of patients with (LMCAD) in terms of surgical or medical treatment.

Methods: This prospective cohort study was conducted on 139 patients (91 men and 48 women) with severe left main coronary artery disease who were diagnosed by coronary angiography from 1st Mar 2014 to 28th Feb 2014. Patients were followed up for one year as to major adverse cardiac and cerebral events (MACCE) including death, non-fatal myocardial infarction, stroke, and hospitalization.

Results: From total of 2661 coronary angiographies, 139 patients (5.2%) with a mean age of 63.2±7.2 years had LMCAD. The mortality rate in the medical treatment group and the surgical group appeared to be 16.7% (6 cases) and 8.7% (9 cases) respectively (p =.156). The rate of stroke in the medical group turned out to be 5.6% (n=2) and in the surgery group 2% (n=2) (p =.27). The rehospitalization rate was 19.4% in the medical treatment group but 4.9% in the surgical group (p =.013). During one year, the survival rate was significantly lower in the medical group than the group undergoing coronary artery bypass graft surgery (58.3% vs. 84.5%) (p =.002).

Conclusions: In the short term, the optimal medical treatment of patients with LMCAD was not significantly different from that of CABG patients in terms of fatal cardiac and cerebral events. However, rehospitalization was more common due to recurrent angina pectoris.

Keywords: unprotected Left main coronary artery disease (LMCAD), Event-free Survival, Major Cardiac and cerebral events (MACCE)

Introduction

THe left main coronary artery usually supplies 75% and sometimes up to 100% of the left ventricle, so diagnosis and urgent revascularization of severe left main coronary artery stenosis seem to be very important(1). Failure to revascularization can lead to serious consequences, including sudden cardiac death secondary to malignant arrhythmias, heart failure, and cardiogenic shock (2.8).Standard treatment is known to be coronary artery bypass graft surgery intervention (CABG). Percutaneous Coronary Intervention (PCI) is an alternative treatment in appropriate cases with patients who are at high risk for surgery.Several studies have revealed the benefits

of (CABG) in the treatment of severe left main stenosis compared with medical treatment. Coronary Artery Surgery Study (CASS) registry was the first study management with an average survival of 13.3 years in CABG patients and 6.6 years in medically treated patients (5-6). Despite tremendous advances in medical treatment, no new comparative study has been conducted between revascularization and medical treatment. Research has revealed that in patients with severe left main stenosis, revascularization, whether through surgery or PCI, is superior to medical treatment. However, some patients may be eligible for surgery, but they do not tend to accept it and are also not suitable for PCI and therefore must undergo medical treatment. This study aimed to compare the one-year outcomes of these patients in terms of surgical or medical treatment.

Materials and Methods

This prospective cohort study was conducted on patients with severe left main coronary artery disease (≥ 5o% diameter stenosis) after the approval of the ethics committee of Shahid Sadoughi School of Medical Sciences in Yazd. Ethics committee code was IR.SSU.MEDICINE.REC.1393.122. All diagnostic coronary angiograms performed at Afshar Hospital in Yazd from 1st Mar 2014 to 28th Feb 2014 were reviewed. Demographic data, symptom presentation, CAD risk factors, functional capacity, and echocardiographic and angiographic findings were recorded for each patient. The severity and extent of coronary artery disease were determined based on syntax score. Left ventricular ejection fraction (LVEF) was estimated by echocardiography. A heart team consisting of a cardiologist an interventional cardiologist, and a cardiac surgeon decided on the patient's suitability for CABG surgery based on the angiographic findings and the patient's condition. Patients who refused surgery were discharged with optimal medical treatment including nitrate, beta-blockers or calcium channel blockers, aspirin, clopidogrel and atorvastatin or rosuvastatin. All patients were followed for 12 months for major cardiac and cerebral events (MACCE) including cardiac death, non-fatal myocardial infarction, recurrent angina leading to hospitalization, and stroke. Statistical analysis was performed by SPSS software version 23. *p*-value of <.05 was considered as significant. Continuous and categorical variables were tested by T-test and Chi-square respectively. Survival analysis in the various groups was compared by Kaplan-Meier survival analysis and log-rank test

Results

Of the 2661 patients (54.6% male,45.4% female) who had undergone coronary angiography from 1st Mar 2014 to 28th Feb 2014 in Afshar Hospital, 139 cases (5.2%) including 91 male with the mean age of 62.8±8.9 years and 48 female with the mean age of 63.95±9.2 years proved to have severe (>50% stenosis) left main coronary artery disease. The Characteristics of the patients are shown in Table 1.

Table 1.

Characteristics of the patients

Patients' Characteristics	No (%)
Age (years) (mean±SD)	63.2±72
Sex	
Male	91 (65.5%)
Female	48 (34.5%)
Risk Factors (%)	
None	6.3
Smoker	22.6
Diabetes	32.2
Hyperlipidemia	52.2
Hypertension	24.2
Involved Vessels (%)	
LM	5.7
LM+ 1VD	40
LM + 2VD	48
LM + 3VD	6.3
SYNTAX Score	50.4±7.5
LVEF (%)	46.6±6.5
Angina Class (%)	
1	71
2	24
3,4	5
Treatment Strategy (%)	
Surgical	74
Medical	26

Totally, 103 patients (74%) underwent CABG and 36 others (26%) received medical treatment. All deaths in the surgical group (9 cases) occurred during the first month and the peak of deaths was the first week of post-operation, while deaths in the medical treatment group occurred gradually and during the first three months after diagnostic coronary angiography. The mortality rate after CABG surgery was 8.7% in the first month, and from this time deaths did not occur until the end of the first year. In contrast, the mortality rate in the group that received medical treatment in the first month

after diagnosis was 11.1%, and at the end of the first year was 16.7%. There was no significant difference between the two groups in terms of death (p=.156) and stroke (p=.27), but recurrent angina was significantly higher in the medical group than the surgical group (p=.013, Figure1).
There was no significant difference between the two groups regarding the severity of coronary artery disease and left ventricular systolic function. One year event-free survival rate was significantly lower in the medical group than in the group undergoing coronary artery bypass graft surgery (58.3% vs. 84.5%)(p = 0.002). (seeTable 2)

Table 2.

Comparison of major cardiovascular events between surgical and medical groups

Events	Medical group (n=36)	Surgical group (n=103)	p-value
Cardiac death	6(16.7)	9 (8.7)	0.156
Stroke	2(5.5)	2 (2)	0.57
Rehospitalization	7(19.4)	5 (4.8)	0.013
Total	15(41.6)	16 (15.5)	0.002

All data are presented as n (%).

Discussion

Coronary artery revascularization, either surgically or percutaneous coronary intervention is a class 1 indication for LMCAD patients (3). Clinical trials comparing medical and surgical treatments are old and performed at a time when drug options were very limited. Therefore, at present, it does not seem logical to refer to those studies because current studies have shown that new anti-ischemic multi-drug therapies have a proven effect on chronic CAD compared to revascularisation (19). However, clinical trials have excluded patients with LMCAD. Therefore, the effectiveness of medical treatment in these patients needs to be re-evaluated. The design of a clinical trial to compare the medical treatment of LMCAD patients with revascularization methods will be delicate and difficult. We, therefore, conducted a small cross-sectional observational study with no ethical issue; it could, however, shed some light on the role of medical treatment.
Our study showed that event-free survival rate in the first year of diagnosis in the patients with severe left main coronary artery disease undergoing medical treatment is lower than those undergoing surgical revascularization. However, this difference is due to the significant effect of recurrent ischemia and not attributed to lethal cardiac or cerebral events. The effectiveness of revascularization by CABG surgery or PCI has been studied in comparison with medical treatment. Because the left main coronary artery usually supplies 75% and sometimes up 100% of the left ventricle, so diagnosis and immediate revascularization of severe left main coronary artery stenosis prove to be very critically important (1). Failure to revascularization can lead to serious consequences, including sudden cardiac death secondary to malignant arrhythmias, heart failure, and cardiogenic shock (2.8) Coronary Artery Surgery Study (CASS) registry identified CABG surgery as superior when compared to medical treatment; continuing survival existed in the long run (5-6). In our study, superiority of CABG in a short period compared to medical treatment in terms of fatal accidents was not confirmed. Sabik et al., in a 20-year follow up study on patients with severe left main stenosis, who had undergone surgery, reported that the survival rate after CABG surgery for 30 days, one year, five years, and ten years were 97.6%, 93.6%, 83%, and 64%, respectively (7).
In our study, the mortality rate after CABG surgery was 8.7% in the first month, and from this time deaths did not occur until the end of the first year. In contrast, in the group that received medical treatment, the mortality rate by the first month after diagnosis was 11.1%, whereas at the end of the first year it showed to be 16.7%. This result indicates that almost all events particularly post-CABG deaths in the patients with left main coronary artery stenosis occur by the first month after surgery. Therefore this period is critical and needs careful cardiovascular care. Generally, the risk of death will greatly reduce if these patients survive this period. Past studies have also shown that the patients with severe left main coronary artery stenosis receiving drug therapy are always exposed to cardiovascular events with a mortality rate of 45% during the first year of follow-up (8), while in our study, mortality in the first year was 16.7%, indicating a significant improvement in the quality of medical treatment compared to the past. Patients undergoing medical treatment are frequently suffering from angina and acute manifestations of ischemia and are hospitalized suffering from ACS. The rate of recurrence of angina and hospitalization in our study was 19.4%, while after CABG, the incidence of

angina pectoris was low. Patients who do not undergo CABG or PCI surgery may have sudden death or acute cardiac failure or cardiogenic shock due to acute myocardial infarction or left ventricular global ischemia that are associated with high mortality and often lacking the opportunity to be treated effectively. Therefore, urgent CABG is the main strategy as the standard treatment. However, in the presence of appropriate coronary artery anatomy, in well-equipped centers with expert interventional cardiologists and patients with high risk for CABG, left main PCI can be helpful as an alternative treatment (9). Several studies have compared the results of CABG with PCI in patients with severe LM coronary artery disease. As the results reveal, these two methods of treatment have a comparable benefit but the difference between the two revascularization strategies is that PCI patients have significantly higher repeat revascularization rates than those undergoing CABG. In contrast, the CVA appeared to be significantly higher in the CABG group (10).

The results of the latest clinical trial comparing the two revascularization strategies indicated that during the five years of follow-up, there was no significant difference between PCI and CABG in terms of the composite outcome of death, stroke, and myocardial infarction (17, 18).

In our study, in the CABG surgery group, CVA has occurred immediately after surgery. Causes of postoperative cerebral events can be due to the concomitant stenosis of the carotid arteries or the embolism of the plaque from the aorta or a left ventricular clot (11). In patients with left main coronary artery stenosis, the concomitant stenosis of the carotid artery is relatively common. Studies demonstrate that 11% -28% of the patients undergoing CABG due to severe left coronary artery stenosis have concomitant carotid artery stenosis (12-13). Therefore, evaluation of these patients is necessary to assure the presence of carotid stenosis. In the cases of the problem being concurrent with severe carotid stenosis, it is necessary for the intervention performed by endarterectomy or carotid stenting in advance or simultaneously (14-15).

In our study, the prevalence of severe LM coronary artery stenosis was 5.2%, which is comparable to other studies that have reported a prevalence of 5-7% (16).

In this study, all patients had severe and advanced coronary artery disease according to the SYNTAX scoring system and therefore were not eligible for PCI. It is noteworthy that 94.3% of our patients with severe LM coronary artery stenosis had simultaneous involvement of one to three other coronary arteries and only 5.7% of the patients had isolated left main coronary artery stenosis, which is consistent with other studies (16).

Conclusion

This study projects that patients who refuse CABG surgery and accept optimal medical treatment fail to show a significant difference in the rate of fatal cardiac and cerebral events in a short term (one year) compared to patients who accept surgery. However, readmission due to angina recurrence is more common.

Suggestions

The role of coronary revascularization in the treatment of LMCAD is undeniable and the vitality of various methods, whether surgical or interventional, is clear and prominent. While the controversy in determining the preferred method of revascularization continues, cardiologists usually use less optimal medical treatment in advanced coronary artery diseases and lead the patients to invasive procedures (20). The greatest benefit of invasive treatments is when the maximum medical treatment fails. With the advent and availability of potent anti-ischemic and antiplatelet drugs, as well as statins that not only stop the growth of atherosclerotic plaques and even regress them, the need for new comparative studies to determine the status of medical therapy for the management of advanced coronary artery disease seems necessary. Using risk classification models based on clinical, anatomical and functional evidence, high-risk and low-risk patients can be identified, and then the invasive or medical treatment strategy can be determined individually.

Limitations

Limitations of this study include 1) Small sample size that has reduced representativeness; 2) An observational study that has diminished its validity; and 3) Resort to just one center that has affected the generalizability of the results.

Conflicts of Interest

There is no conflict of interest for people involved in this study.

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