Journal of Biology and Today's World
ISSN 2322-3308
http://www.journalbio.com

Received: 10 October 2014 • Accepted: 18 November 2014

Short C

doi:10.15412/J.JBTW.01031104

Comparison of survival rate between coronary artery bypass surgery and angioplasty based on number of diseased coronary vessels

Alireza Rai[1], Mohammad Reza Saidi[1*], Hashem kazerani[1], Amir hosein Hashemian[2], Zahra Jalili[1], Mostafa Bahremand[1], Nahid Salehi[1], Raheem Nanvaee[3]

[1] Cardiology Department, Medical School, Kermanshah University of Medical Sciences, Kermanshah, Iran

[2] Research Center for Environmental Determinants of Health (RCEDH), Kermanshah University of Medical Sciences, Kermanshah, Iran

[3] Kermanshah University of Medical Sciences, Kermanshah, Iran

*correspondence should be addressed to Mohammad Reza Saidi, Cardiology Department, Medical School, Kermanshah University of Medical Sciences, Kermanshah, Iran; Tell: +988338362022; Fax: +988338362022; Email: Imamaliamozesh@yahoo.com.

ABSTRACT

This study has been conducted to compare one-year survival rate of patients who underwent coronary artery bypass surgery (CABG) vs. percutaneous coronary intervention (PCI) in general as well as considering the number of diseased coronary vessels. In this retrospective study, we reviewed the medical records of patients who underwent CABG (484 cases) or PCI (292 cases) at out university heart center from 2009 to 2012. The mortality and survival was compared between the two studied groups based on left ventricular function and number of diseased coronary vessels. Twenty-seven patients (5.57%) died in CABG group which was significantly higher than in PCI group (8 cases, 2.73%); P= 0.04. However, no significant difference was observed regarding mortality between CABG and PCI groups in one- diseased vessel (5.15% vs. 2.22%, P= 0.28), two- diseased vessel (6.12% vs. 3.57%, P= 0.41), and three-vessel disease (5.41% vs.0, P= 0.4). Although PCI was associated with a better one-year survival rate compared to CABG, but number of the diseased coronary vessels did not affect survival rate significantly.

Key words: Coronary arteries bypass surgery, angioplasty, coronary vessel, survival

1. INTRODUCTION

When symptoms of coronary artery disease (CAD) become severe and medical therapy cannot control symptoms, two options are available for patients: coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI). CABG was first introduced in 1968 and rapidly became a standard way to alleviate ischemic symptoms in CAD patients (1). With advancements achieved in CABG, morbidity and mortality of this procedure decreased over time and success rate increased significantly (2, 3). In spite of introduction of minimally invasive methods in recent decade, CABG is still considered as first choice for patients who are not candidate for percutaneous surgeries or diabetic patients with involvement of two coronary vessels, or in some patients with left ventricular (LV) dysfunction. Angioplasty was introduced in 1977 as an alternative for CABG in selected patients. This is a less invasive method compared to CABG with good outcomes (4, 5). There is increasing evidence that PCI use in CAD patients is growing with observation of successful outcomes (6). There are controversies about survival and mortality between CABG and PCI methods. For example Bravata et al. in their meta-analysis of 23 randomized clinical trials reported similar 10-year survival for both CABG and PCI, but a higher rate of procedure-related stroke in CABG group compared to PCI (7). However, in another study on 988 patients during a 4-year period, authors reported better survival after 6 years of follow-up in CABG group (mortality of 6.8%) in comparison to PCI patients (mortality of 10.9%) (8). Likewise other studies also reported better outcomes with CABG rather than PCI (9, 10). These controversies stem from some factors such as heterogeneous nature of the studies including in meta-analyses, different stent types used for patients, multi-vessel disease, LV function, and etc. The objective of this study was to compare one-year survival rate of patients who underwent CABG in comparison to PCI in terms of the number of diseased coronary vessels as well as left ventricular (LV) function.

2. MATERIALS AND METHODS

In this retrospective study, medical records of patients who underwent CABG (484 cases) or angioplasty (292 cases) at out university heart center from 2009-2012 were reviewed (a total of 776 cases). The patients were divided into 3 groups based on LV function: normal (LV ejection fraction (LVEF)> 50%), mild-moderate LV dysfunctioning (LVEF= 35-50%) and severe LV dysfunctioning (LVEF< 35%). Furthermore, the patients were divided into 3 groups based on the number of diseased coronary vessels: only left anterior descending (LAD) artery involvement, involvement of 2 vessels which one of them was LAD, and involvement of 3 vessels. The patients of CABG croup were excluded if they received procedures simultaneously other than CABG including valve repair or replacement or any kind of procedures on the aorta. Likewise, in angioplasty group those who received other procedures such as PTMC were excluded. Patients with systolic blood pressure above 180 mmHg and/or diastolic blood pressure over 110 mmHg and blood sugar more than 350 mg/dL were excluded from the study as well. Patients who did not meet these exclusion criteria were entered into the study. After gathering the required data from the records, the patients were contacted via phone calls and their survival was documented. The collected data were analyzed with the SPSS software forversion number 15.0). Descriptive indices such as frequency, percentage, mean and its standard deviation (Mean±SD) were used to express the data. Comparisons of mortality rate both in general as well as considering the number of diseased coronary vessels were made between the two studied groups with using the Chi-squared test. Significance level was set at P< 0.05.

3. RESULTS AND DISCUSSION

There were 516 males (66.4%) and 260 females (33.5%). Table 1 presents the gender and age distribution between the two groups with considering cardiovascular diseases risk factors and LVEF values.

Table 1. Comparison of demographic, cardiovascular diseases risk factors and left ventricular ejection fraction between angioplasty and coronary artery bypass surgery groups

		Total	*CABG*	*Angioplasty*	*P value*
Gender	Male	516 (66.4%)	334 (69%)	200 (68.5%)	-
	Female	260 (33.5%)	150 (31%)	92 (31.5%)	
Age		56.5 (±9.9)	56.5 (±9.7)	56.6 (±10.1)	-
Hypertension		302 (38.9%)	170 (35.1%)	125 (42.6%)	0.38
Diabetes mellitus		163 (21%)	97 (20%)	64 (21.9%)	0.86
Smoking		210 (27%)	116 (23.9%)	87 (29.6%)	0.42
Dyslipidemia		256 (32.9%)	160 (33.1%)	94 (32.2%)	-
LVEF	> 50%	418 (53.9%)	254 (52.5%)	164 (56.2%)	0.3
	35-50%	244 (31.5%)	151 (31.2%)	93 (31.9%)	
	< 35%	114 (14.6%)	79 (16.3%)	35 (11.9%)	

NS= non-significant; LVEF= left ventricular ejection fraction

As shown, no statistically significant difference was detected between the two groups in terms of age, gender, and conventional cardiovascular diseases risk factors. Likewise, there was no difference between the groups regarding to LVEF. In angioplasty group frequency distribution of the number of involved coronary arteries is as following: one-vessel involvement (135 cases, 46.23%), two-vessel involvement (140 cases, 48%), and three-vessel involvement (17 cases, 5.82%). Distribution of patients in CABG group according to the number of affected coronary vessels includes following: one-vessel (including LAD) involvement (97 cases, 20%), two-vessel (including LAD) involvement (147 cases, 30.37%), and three-vessel involvement (240 cases, 49.58%). Twenty-seven patients (5.57%) died in CABG group which this rate is significantly higher than in PCI group (8 cases, 2.73%); P= 0.04. Table 2 presents comparison of mortality between CABG and angioplasty group based on the number of involved coronary arteries.

Table 2. Comparison of mortality rate between CABG and angioplasty groups according to the number of coronary arteries involved

	CABG	*Angioplasty*	*P value*
One-vessel	5/97 (5.15%)	3/135 (2.22%)	0.28
Two-vessel	9/147 (6.12%)	5/140 (3.57%)	0.41

Three-vessel	13/240 (5.41%)	0/17	0.4
Total	27/484 (5.57%)	8/292 (2.73%)	0.04

CABG= coronary artery bypass grafting

As seen, no statistically significant difference exists between CABG and angioplasty regarding number of coronary arteries involvement. Table 3 presents mortality between the two studied groups based on LVEF category.

Table 3. Comparison of mortality due to cardiac causes between CABG and PCI groups based on LVEF category

		CABG	*Angioplasty*	*P value*
LVEF	> 50%	3/254 (1.1%)	0/164	0.28
	35-50%	8/151 (5.3%)	3/93 (3.2%)	0.54
	< 35%	15/79 (19%)	3/35 (8.6%)	0.26

CABG= coronary artery bypass grafting; LVEF= left ventricular ejection fraction

No significant difference is observed between CABG and PCI groups at different LVEF categories. Similar to number of involved coronary arteries, no significant difference is seen between CABG and angioplasty groups at different LVEF values. In CABG group, 346 cases underwent off pump CABG. Of this, 19 patients died (5.49%). in 138 cases who underwent on pump CABG, 7 cases died (5.07%); P= 0.5. The obtained results showe that overall PCI patients had better one-year outcome in terms of mortality/survival in comparison to CABG patients. However, regarding LVEF or number of the diseased coronary vessels no statistically significant difference was observed between CABG and PCI groups. It is known that both CABG and PCI are standard treatments for CAD patients, although some believe that CABG is still the preferred method, at least for diabetic patients and those with multi-vessel diseases (6-8). Both treatments have seen considerable advancements during the past two decades (11). PCI has advantages over CABG including more rapid recovery and quicker discharge from hospitals as well as considering the less invasive nature of PCI compared to CABG. However, it is not always feasible to perform PCI instead of CABG. Although PCI is less invasive than CABG, it does not translate that this method is essentially better than CABG regarding mortality rate as reported by some previous studies (9, 10). This is in contrast to what we observed in our study. Here, the two studied groups were similar in terms of cardiovascular diseases risk factors and LVEF. However, one-year survival was better in PCI group than in CABG group as demonstrated by less cardiac-related deaths in PCI group. In the next step we decided to examine the effect of LVEF simultaneously with the number of the diseased coronary vessels on mortality rate. The log-rank analyses results showed that there was no significant difference between the two groups regarding these factors. This was also correct for three- diseased vessel, a major topic of attention for researchers (11-13). This issue has been studied in both low-risk and high-risk patient groups. Li et al. (13) studied 3720 patients with multi-vessel disease in whom underwent isolated CABG surgery or received drug-eluting stents. They reported that patients who received drug-eluting stents had higher 3-year rates of target-vessel revascularization. This group also experienced higher rates of death and myocardial infarction than CABG group, a finding which contradicts ours. They concluded that CABG was associated with better results regarding mortality in patients with multi-vessel disease. A similar finding was also reported by Brener et al. (14). They studied 6,033 patients (872 PCI cases and 5161 CABG patients). A total of 931 deaths were documented during 5-year of follow-up period. The 1- and 5-year unadjusted mortality rates were 5% and 16% for PCI and 4% and 14% for CABG. According to their results, PCI was associated with an increased risk of death. They concluded that CABG was associated with better survival than PCI after adjustment for risk profile in patients with multi-vessel disease. In terms of LV dysfunction, we did not observe any difference between PCI and CABG groups. However, Yusuf et al. (12) reported that benefits of CABG were greater in the presence of LV dysfunction compared to PCI. Many randomized trials did not include patients with high-risk conditions such as low LVEF. For example, in analysis performed by Soran et al. (11) on 15 randomized trials, neither of them included patients with LV dysfunction nor diabetes. We faced some limitations in this study namely short follow-up period and low sample size and insufficient information about CABG and PCI detailed data due to the retrospective nature of this study.

4. CONCLUSION

In conclusion, each method of CABG or PCI has its own advantages and disadvantages. We found a better survival rate in PCI patients than in CABG patients. However, number of diseased vessels or LVEF category did not affect survival/mortality rate between these two treatments.

ACKNOWLEDGMENT

No mentioned any acknowledgment by authors.

AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

REFERENCES

1. Favaloro RG. Saphenous vein autograft replacement of severe segmental coronary artery occlusion: operative technique. The Annals of thoracic surgery. 1968;5(4):334-9.
2. Flynn M, Reddy S, Shepherd W, Holmes C, Armstrong D, Lunn C, et al. Fast-tracking revisited: routine cardiac surgical patients need minimal intensive care. European journal of cardio-thoracic surgery. 2004;25(1):116-22.
3. Barner HB. Operative treatment of coronary atherosclerosis. The Annals of thoracic surgery. 2008;85(4):1473-82.
4. Boden WE, O'Rourke RA, Teo KK, Hartigan PM, Maron DJ, Kostuk WJ, et al. Optimal medical therapy with or without PCI for stable coronary disease. New England Journal of Medicine. 2007;356(15):1503-16.
5. Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, et al. Heart disease and stroke statistics--2014 update: a report from the American Heart Association. Circulation. 2014;129(3):e28-e292.
6. Serruys PW, Morice M-C, Kappetein AP, Colombo A, Holmes DR, Mack MJ, et al. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. New England Journal of Medicine. 2009;360(10):961-72.
7. Bravata DM, Gienger AL, McDonald KM, Sundaram V, Perez MV, Varghese R, et al. Systematic review: the comparative effectiveness of percutaneous coronary interventions and coronary artery bypass graft surgery. Annals of Internal Medicine. 2007;147(10):703-16.
8. Booth J, Clayton T, Pepper J, Nugara F, Flather M, Sigwart U, et al. Randomized, controlled trial of coronary artery bypass surgery versus percutaneous coronary intervention in patients with multivessel coronary artery disease six-year follow-up from the stent or surgery trial (SoS). Circulation. 2008;118(4):381-8.
9. Daemen J, Boersma E, Flather M, Booth J, Stables R, Rodriguez A, et al. Long-term safety and efficacy of percutaneous coronary intervention with stenting and coronary artery bypass surgery for multivessel coronary artery disease a meta-analysis with 5-year patient-level data from the ARTS, ERACI-II, MASS-II, and SoS Trials. Circulation. 2008;118(11):1146-54.
10. Hannan EL, Wu C, Walford G, Culliford AT, Gold JP, Smith CR, et al. Drug-eluting stents vs. coronary-artery bypass grafting in multivessel coronary disease. New England Journal of Medicine. 2008;358(4):331-41.
11. Soran O, Manchanda A, Schueler S. Percutaneous coronary intervention versus coronary artery bypass surgery in multivessel disease: a current perspective. Interactive cardiovascular and thoracic surgery. 2009;8(6):666-71.
12. Yusuf S, Zucker D, Passamani E, Peduzzi P, Takaro T, Fisher L, et al. Effect of coronary artery bypass graft surgery on survival: overview of 10-year results from randomised trials by the Coronary Artery Bypass Graft Surgery Trialists Collaboration. The Lancet. 1994;344(8922):563-70.
13. Li Y, Zheng Z, Xu B, Zhang S, Li W, Gao R, et al. Comparison of Drug-Eluting Stents and Coronary Artery Bypass Surgery for the Treatment of Multivessel Coronary Disease Three-Year Follow-Up Results From a Single Institution. Circulation. 2009;119(15):2040-50.
14. Brener SJ, Lytle BW, Casserly IP, Schneider JP, Topol EJ, Lauer MS. Propensity analysis of long-term survival after surgical or percutaneous revascularization in patients with multivessel coronary artery disease and high-risk features. Circulation. 2004;109(19):2290-5.