



# EVALUATION OF PERCUTANEOUS CORONARY INTERVENTION WITH STENTING OF IMPROVEMENT OF LEFT VENTRICULAR FUNCTION IN PATIENTS WITH SINGLE VESSEL CORONARY ARTERY DISEASE

*Robertas Pranevičius<sup>1</sup>, Kasparas Briedis<sup>1</sup>, Norvydas Zapustas<sup>2</sup>, Ažuolas Sirtautas<sup>2</sup>, Kamilija Tvaronavičiūtė<sup>2</sup>.*

<sup>1</sup>*Hospital of Lithuanian University of Health Sciences Kauno klinikos, Department of Interventional Cardiology, Kaunas, Lithuania*

<sup>2</sup>*Lithuanian University of Health Sciences, Kaunas, Lithuania*

## ABSTRACT

**Introduction.** LV function may improve after revascularization of coronary occlusions or using a significant amount of medication. However the quality of life of every patient who is indicated with a acute coronary syndrom is not well characterized.

**Aim of the study.** The purpose of the current study was to evaluate the effect of coronary stenting on systolic and diastolic LV function.

**Material and methods.** We studied 98 patient with coronary artery disease , ages 42-86 years (mean 56.6 years) referred for PCI with stenting . Echocardiography was performed in all patients before and within 48 hours after PCI stenting.

**Results.** From systolic indices : left ventricular EF (ejection fraction) significantly increased (from 42.55 % to 57.32 % p-value < 0,001), left ventricular Fs (fractional shortening) significantly increased (from 26.54% to 29.75%, p- value <0,001) and left ventricular wall motion scoring index significantly reduced ( from 1.05 to 1.00, p value<0,001).From diastolic indicators : left ventricular E velocity increased significantly ( from 0.79 to 0.84 Cm/sec , p-value <0,001) , E/a ratio increased significantly (from 1.18 to 1.34, p value <0,001), left ventricular deceleration time had a significant reduction (from 230.33 to 219.42 msec, p value <0.001) and left ventricular IVRT decreased significantly ( from 84.74 to 79.2 p value < 0.001).

**Conclusions.** In this study, significant improvement in systolic and diastolic left ventricular function after angioplasty stenting were observed.

**Keywords:** Percutaneous coronary intervention, single vessel coronary artery disease.

## Introduction

World-wide, heart diseases is the leading cause of death in both genders, with coronary artery disease (CAD) being the major cause of morbidity and mortality which increases dramatically (1). CAD causes the limiting blood flow which causes myocardial infarction, chest pain, and if not treated heart failure in the future.

In patients with vessel CAD, coronary revascularization may be performed using either percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). Often the decision is made according to the amount of arteries which are damaged and according to the percented of the occlusion. Like multivessel CAD, may be treated with comparable outcomes by either PCI or CABG (2-3). When comparing PCI and CABG, studies have demonstrated no significant difference between the two procedures in mortality, however CABG is superior in event free survival (3-6).

It is estimated that greater than 650,000 new cases of heart failure occur annually with reduced left ventricular (LV) function in about half of these patients which leads to heart failure (3). Generally, it is believed that the sooner the ischemic myocardium get reperfused by PCI, the better the patient's LV function recovers and the heart failure reduces (7-8).

LV function may improve not only after revascularization of coronary occlusions, but also using a significant amount of medication which gives a huge discussion in the medical society. Currently, coronary angiography and percutaneous coronary intervention are often performed in stable patients with good exercise tolerance who have not been treated with proven medications such as aspirin, statins and beta-adrenergic blocking agents in conjunction with comprehensive lifestyle modification. The results of the Atorvastatin Versus Revascularization Treatment (AVERT) study have rekindled the debate concerning the preferred therapeutic strategy in patients with stable single- or double-vessel coronary artery disease (CAD) (9).

Consensus currently exists that coronary artery bypass grafting (CABG) is the treatment of choice for patients with significant obstruction of the left main coronary artery, as well as for those with triple-vessel disease and diminished left ventricular systolic function, but as the patient has one vessel disease the best treatment is still not clear.

In patients with stable CAD or one vessel disease, percutaneous transluminal coronary angioplasty (PTCA) has generally been recommended for coronary stenoses which causes symptoms and

ischemia proved by test and angina which doesn't respond medical therapy. However, some interventional cardiologists often dilate significant coronary stenoses whether or not they are causing symptoms or producing evidence of ischemia on provocative testing. The reason for this broader utilization of PTCA is the belief that the more obstructive a plaque is, the more frequently it progresses to coronary occlusion (10).

However as we have studies on both topics still we do not have one right treatment guideline for patients which has single vessel coronary artery disease and which are indicated with acute coronary syndrome, the quality of life for these patients is not well characterized. The purpose of the current study was to evaluate the effect of coronary stenting on systolic and diastolic LV function.

## Materials and Methods

All the patients underwent successful PCI and no serious periprocedural complication was reported. Baseline clinical, angiographic and procedural findings were collected retrospectively, and clinical outcome data were recorded in the dedicated PCI registry by research personnel.

The inclusion criteria of the study were age between 40 and 80 years for both genders, PCI had > 50% in one vessel with no history of coronary obstructive pulmonary disease or any other chronic respiratory conditions, no history of coronary artery bypass grafting or valvular surgery, presence of persistent sinus rhythm, no history of renal or hepatic failure, no history of cardiomyopathy. All the patients underwent successful PCI and no serious periprocedural complication was reported.

We studied 98 patients with coronary artery disease, ages 42-80 years (mean 56.6 years) referred for PCI with stenting. Echocardiography was performed in all patients before and within 48 hours after PCI stenting.

Differences in baseline characteristics were analyzed by t-test for continuous variables and chi-square test for categorical variables. Regression models examining changes from baseline used mixed regression models. Repeated measures were treated as clustered within the individual patients.

## Results

The findings of the current study demonstrated a significant improvement in both systolic and diastolic functions: Left ventricular EF (ejection fraction) significantly increased (from 42.55% to 57.32% p-value < 0,001), left ventricular Fs (fractional shortening) significantly increased (from 26.54% to 29.75%, p-value <0,001) and left ventricular wall motion scoring index significantly reduced (from 1.05 to 1.00, p value <0,001). From diastolic indicators: left ventricular E velocity increased significantly (from 0.79 to 0.84 Cm/sec, p-value <0,001), E/a ratio increased significantly (from 1.18 to 1.34, p value <0,001), left ventricular deceleration time had a significant reduction (from 230.33 to 219.42 msec, p value <0.001) and left ventricular IVRT decreased significantly (from 84.74 to 79.2 p value < 0.001).

## Discussion

It is a commonly held belief among medical professionals that PCI will be more beneficial to patients than medical therapy, but no data supports such a claim. Based on our current understanding of the pathophysiology behind unstable coronary syndromes, PTCA and medical therapy should be viewed as complementary, rather than opposing, strategies. Before a relatively stable patient with

angina is referred for PTCA, practitioners should employ the fundamental ABC's of stable angina management: Aspirin and Antianginals, Beta-blockers and Blood pressure control, Cholesterol management and Cigarette cessation, Dietary improvements and Diabetes control, Education and Exercise (11).

## Conclusion

In this study significant improvement in systolic and diastolic left ventricular function after angioplasty stenting were observed. For further investigating the study had some limitations that are needed to be mentioned. The small sample size, which we will increase in the nearest study, was an important shortcoming of the current study. It should be noted that a limited number of patients met the inclusion criteria and were enrolled into the study. Besides, this was a single center study and, consequently, our results cannot be generalized unless they are reconfirmed in larger multi-center studies. Additionally, we just included single-vessel coronary disease patients with no control group. Finally, we did not study the type, size, and length of the used stents and the anatomical features of the stenotic artery. These factors could have affected the cardiac function either before or after the procedure.

## References

1. Lee MS, Yang T, Dhoot J, Iqbal Z, Liao H. Meta-analysis of studies comparing coronary artery bypass grafting with drug-eluting stenting in patients with diabetes mellitus and multivessel coronary artery disease. *American Journal of Cardiology*. 2010;105(11)
2. Zhang F, Yang Y, Hu D, Lei H, Wang Y. Percutaneous coronary intervention (PCI) versus coronary artery bypass grafting (CABG) in the treatment of diabetic patients with multi-vessel coronary disease: a meta-analysis. *Diabetes Res ClinPract*. 2012;97(2):178-84.
3. Shiomi H, Morimoto T, Furukawa Y, Nakagawa Y, et al. Comparison of Five-Year Outcome of Percutaneous Coronary Intervention With Coronary Artery Bypass Grafting in Triple-Vessel Coronary Artery Disease (from the Coronary Revascularization Demonstrating Outcome Study in Kyoto PCI/CABG Registry Cohort-2). *American Journal of Cardiology*. 2015;116(1):59-65.
4. Qi X, Xu M, Yang H, Zhou L, Mao Y, Song G, Li Q, Yang C. Comparing mortality and myocardial infarction between coronary artery bypass grafting and drug-eluting stenting in patients with diabetes mellitus and multivessel coronary artery disease: a meta-analysis. *Arch Med Sci*. 2014;10(3):411-8.
5. Panchai K, Patel S, Bhatt P. Drug-eluting stents in multivessel coronary artery disease: cost effectiveness and clinical outcomes. *AdvPharmacol Sci*. 2012;2012:679013.
6. Moss E, Alam M, Ballantyne CM, Puskas JD. Coronary artery bypass grafting surgery remains the standard of care for patients with diabetes. *Semin Thorac Cardiovasc Surg*. 2013;25(2):97-9.
7. Al Ali J, Franck C, Filion KB, Eisenberg MJ. Left main coronary artery stenosis: a meta-analysis of drug-eluting stents versus coronary artery bypass

- grafting. *JACC CardiovascInterv.* 2014;7(5):497-506.
8. D.L. Appleton, A. Abbate, G.G. Biondi-Zoccai, Late percutaneous coronary interven- tion for the totally occluded infarct-related artery: a meta-analysis of the effects on cardiac function and remodeling, *Catheter. Cardiovasc. Interv.* 71 (2008) 772–781.
  9. B. Pitt, D. Waters, W.V. Brown, *et al.* Aggressive lipid-lowering therapy compared with angioplasty in stable coronary artery disease N
  12. mmendations. *Circulation* 1999;99:2829 – 48.
  - Engl J Med, 341 (1999), pp. 70–76
  10. Magnuson EA, Farkouh ME, Fuster V, Wang K, et al. Cost-effectiveness of percutaneous coronary intervention with drug eluting stents versus bypass surgery for patients with diabetes mellitus and multivessel coronary artery disease: results from the FREEDOM trial. *Circulation.* 2013;127(7):830-31.
  11. ACC/AHA/ACP-ASIM guidelines for the management of patients with chronic stable angina: executive summary and reco