

## Comparison of health-related quality of life after percutaneous coronary intervention and coronary artery bypass surgery

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### Original Article

#### Abstract

**BACKGROUND:** Health-related quality of life (HRQOL) evaluation is an important measure of the impact of the disease. As more people with coronary heart disease (CHD) live longer, doctors and researchers want to know how they manage in day to day life. It looked like adults with CHD had a decrease QOL. The aim of this study was to comparison of HRQOL of patients who underwent percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) and to assess its main determinants in the whole sample of coronary artery disease (CAD) patients.

**METHODS:** The study was carried out to estimate HRQOL of 109 patients who underwent invasive coronary revascularization [PCI (n = 75) and CABG (n = 34)]. We applied HRQOL after 6 months and 2 years in both groups and scores were compared. The HRQOL data were obtained using MacNew Heart Disease questionnaire with dimensions emotional, physical and social that estimated. Data entry and analysis were performed by SPSS.

**RESULTS:** A total MacNew scale in CABG and PCI group in 6 months after treatment were  $45.32 \pm 13.75$  and  $53.52 \pm 15.63$ , respectively ( $P = 0.010$ ). After 2 years HRQOL mean changed to  $51.176 \pm 14.80$  and  $49.55 \pm 16.22$ , respectively, in CABG and PCI group ( $P = 0.428$ ). Our results in within-group analysis showed total MacNew scale and its subscales were changed significantly after 2 years in CABG and PCI group's scores were detected. We found in the whole sample of CAD patients those who had a higher level of income and education and were not either overweight or obese experienced better HRQOL.

**CONCLUSION:** Our results showed that patients who underwent PCI experienced significantly higher HRQOL in 6 months after revascularization but over 24 months follow-up no difference was observed between the two groups.

**Keywords:** Quality of Life, Percutaneous Coronary Intervention, Coronary Artery Bypass Graft, MacNew Scale, Iran

*Date of submission:* 5 Oct 2014, *Date of acceptance:* 4 Apr 2016

#### Introduction

Coronary artery disease (CAD) is the result of the accumulation of atherosclerotic plaques within the walls of the coronary arteries leading to narrowing of the blood vessels, heart failure, angina pectoris, and myocardial infarction (MI). The CAD is the leading and the most common

cause of morbidity and mortality in worldwide.<sup>1-</sup>

<sup>3</sup> It is estimated that low- and middle-income countries contribute to about 80% of cardiovascular disease deaths in world.<sup>4</sup>

Recent data show a high prevalence of CAD and its risk factors such as cigarette smoking, diabetes mellitus, hypertension, dyslipidemia,

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low level of physical activity, and obesity among Iranian population.<sup>5,6</sup>

Although numerous studies have compared the outcomes of coronary revascularization between percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) surgery but beyond the survival benefit of CABG and PCI, functional recovery is the expectation of patients who receive these treatments for relief of symptoms. Therefore, an importance of health-related quality of life (HRQOL) in clinical research has been extensively discussed over recent decades and there is an increasing recognition among clinicians and researchers that the impact of chronic illnesses and their treatments must be assessed in terms of their HRQOL in addition to more traditional measures of clinical outcomes—morbidity and mortality.<sup>7,8</sup> The HRQOL has also been used increasingly as a factor in cost effectiveness analysis and health technology assessment that is used to determine the relative value for many of different forms of the treatment.<sup>9</sup> Hence, information on HRQOL of patients in different modes of coronary revascularization and its determinants is so important to defining a comprehensive plan of care. Since there are few studies regarding HRQOL of CAD in different therapeutic interventions in developing countries, therefore the main aim of this study was to comparison of HRQOL of patients who underwent CABG and PCI and to assess its main determinants in the whole sample of Iranian CAD patients.

### Materials and Methods

A follow-up provident study was carried out after 6 and 24 months on patients who underwent coronary revascularization with either PCI or CABG. We identified between 20 March, 2010, and 20 September, 2010, about 389 patients underwent coronary revascularization at Chamran Heart Center of Isfahan, Iran. Before enrollment, the patients received detailed written and verbal information regarding the aims and protocol of the study and signed informed consent. If patients had ability to answer the questions, they filled it personally; otherwise a trained interviewer collected the necessary data through face-to-face

interviews with respondents. The study has been approved by the Ethics Committee of the Isfahan University of Medical Sciences. Patients were excluded if they had prior PCI, CABG or also required valve surgery and passed < 6 months from their treatment. Finally among eligible patients, 109 [PCI (n = 75) and CABG (n = 34)] consented to enter the study. After treatment, 6 and 24 months QOL was evaluated to all participants of both groups.

The HRQOL data were obtained using MacNew Heart Disease HRQOL questionnaire that is a disease specific questionnaire designed to measure HRQOL in patients with cardiac disease, particularly MI and other types of ischemic heart disease.<sup>10</sup> The questionnaire validated and translated to Farsi by Asadi-Lari *et al.*<sup>11</sup> The MacNew consists of 27 questions that inquire about symptoms such as angina/chest pain, shortness of breath, fatigue, dizziness, and aching legs and finally summarized into three main domains, emotional, physical, and social wellbeing. Scoring of the MacNew is straight-forward the maximum possible score in any domain is 7 (high HRQOL) and the minimum is 1 (poor HRQOL). All scales were transformed so that they had a possible range of 0-100, with a higher score indicating a better level of functioning or HRQOL. Socio-demographic, clinical and comorbidity data were extracted from patients' medical records.

The continuous variables were expressed as a mean  $\pm$  standard deviation and categorical variables as absolute numbers and percentages. We studied the association between and within groups in quantitative variables by paired Student's t-test and independent t-test. All statistical tests were two-sided and the significance level was set at 0.05. For QOL scores, distribution used Kolmogorov-Smirnov test. For the test of investigation, the relationship between data and demographics variables were analyzed by chi-square-test. A linear regression model was employed to examine the effect of variables and characters on QOL aspects in CAD patients. We used of Pearson correlation coefficient for study association of HRQOL with characteristics of patients. SPSS software for Windows (version

16.0, SPSS Inc., Chicago, IL, USA) was used to analysis the data.

## Results

From all recruited patients 109 (after 6 months) and 106 persons (after 24 months) completed the questionnaire. One patient in CABG group and two patients in PCI group died during follow-up. Main characteristics of the studied patients are summarized in table 1. The two groups were tested for significant differences regarding socio-demographic and main comorbidity and clinical variables. As seen, the groups can be considered equivalent with no statistically significant differences between them ( $P > 0.050$ ) except in education level ( $P = 0.009$ ). The tests of HRQOL distribution were normal. The mean age of the patients in CABG and PCI group were  $53.2 \pm 5$  and  $51.2 \pm 6.2$  years, respectively, did not show a significant difference ( $P = 0.207$ ). Our results showed that, respectively, in CABG and PCI group (79.4%) and (85.3%) were male, (76.5%) and (50.7%) had < 6 grades education, (79.4%) and (86.7%) were employed, (47.1%) and (54.7%) were smoker, (26%) and (29.3%) had diabetes comorbidity, (32.4%) and (33.3%) had hypertension, (47.1%) and (52.0%) were overweight or obese, (38.2%) and (56.0%) had history of MI and (52.9%) and (53.3%) had hypercholesterolemia.

### Between-group comparison results

Table 2 shows the mean difference scores for total and the three subscales of the MacNew in two groups 6 months and 2 years after revascularization. According to mean difference QOL score in 6 and 24 months after treatment by independent student's test in CABG and PCI were  $8.20 \pm 3.12$  ( $P = 0.010$ ) and  $2.61 \pm 3.28$ , respectively ( $P = 0.428$ ). The overall QOL score in CABG and PCI group in 6 months after treatment were  $45.32 \pm 13.75$  and  $53.52 \pm 15.63$ , respectively ( $P = 0.010$ ). After 2 years these numbers changed to  $51.17 \pm 14.80$  and  $49.55 \pm 16.22$ , respectively, in CABG and PCI group ( $P = 0.428$ ). The highest score of the MacNew subscales was found in the physical ( $46.19 \pm 14.87$ ) and social ( $55.62 \pm 16.75$ ) subscales in CABG and PCI group (after 6

months). However, after 2 years, the best results of the MacNew subscales were related to the emotional subscales and the lowest score was related to physical dimension in both groups. The results showed significant difference in 6 months after treatment (0.01), whereas HRQOL was not a significant difference between two groups (0.428) after 2 years (Table 2).

**Table 1.** Characteristics of patients in coronary artery bypass graft (CABG) (n = 34) and percutaneous coronary intervention (PCI) (n = 75) group

Indicator	CABG n (%)	PCI n (%)	P
Sex			
Male	27 (79.4)	64 (85.3)	0.438
Age			
< 50	8 (23.5)	29 (38.7)	0.123
≥ 50	26 (76.5)	46 (61.3)	
Education			
< 6 grade	26 (76.5)	38 (50.7)	0.009
≥ 6 grade	8 (23.5)	37 (49.3)	
Income			
Low	17 (50.0)	26 (34.7)	0.267
Middle	12 (35.3)	31 (41.3)	
High	5 (14.7)	18 (24.0)	
Employment			
Employed	27 (79.4)	65 (86.7)	0.328
Smoking	16 (47.1)	41 (54.7)	0.461
Diabetes	9 (26.5)	22 (29.3)	0.747
Hypertension	11 (32.4)	25 (33.3)	0.920
BMI			
< 25	18 (52.9)	36 (48.0)	0.626
≥ 25	16 (47.1)	39 (52.0)	
History of MI	13 (38.2)	42 (56.0)	0.086
Hypercholesterolemia	18 (52.9)	40 (53.3)	0.967

Chi-square test; CABG: Coronary artery bypass graft; PCI: Percutaneous coronary intervention; BMI: Body mass index; MI: Myocardial infarction

### Within-group comparison results

Results of within-group by paired Student's t-test showed that in CABG group total MacNew scale were significantly increase ( $P = 0.001$ ) but no significant in [emotional ( $P = 0.122$ ), physical ( $P = 0.026$ ), social ( $P = 0.064$ )]. While significantly decrease (0.016) in PCI group's scores and in subscale except of emotional ( $P = 0.244$ ) difference significant on physical ( $P = 0.007$ ) and social ( $P = 0.025$ ) dimensions were detected (Table 3).

**Table 2.** The mean difference of MacNew Scale scores in coronary artery bypass graft (CABG) and percutaneous coronary intervention (PCI) group 6 months and 2 years after revascularization (between-group comparison)

MacNew Scale	After 6 months	Mean ± SD	P	After 2 years	Mean ± SD	P
Total score						
CABG	45.32 ± 13.75	-8.20 ± 3.12	0.010	51.17 ± 14.80	2.61 ± 3.28	0.428
PCI	53.52 ± 15.63			49.55 ± 16.22		
Emotional						
CABG	46.15 ± 16.12	-7.60 ± 3.39	0.027	51.80 ± 17.20	0.65 ± 3.71	0.861
PCI	53.75 ± 16.53			51.14 ± 18.12		
Social						
CABG	45.29 ± 13.88	-10.33 ± 3.29	0.002	51.35 ± 15.10	0.47 ± 3.51	0.894
PCI	55.62 ± 16.75			50.88 ± 17.57		
Physical						
CABG	46.19 ± 14.87	-7.79 ± 3.39	0.024	50.39 ± 14.11	3.56 ± 3.32	0.285
PCI	53.46 ± 17.32			46.82 ± 16.72		

Comparison between group in 6 month and after 2 years (independent Student's t-test); CABG: Coronary artery bypass graft; PCI: Percutaneous coronary intervention; SD: Standard deviation

### HRQOL of CAD Patients 6 months after revascularization

The mean total MacNew scale and emotional, social and physical subscale in CAD patients (sum of HRQOL options in both groups) were 50.96 ± 15.48, 51.38 ± 16.71, 52.39 ± 16.55 and 51.55 ± 16.72, respectively. Factors predictive in relation to the QOL were analyzed by linear regression.

Our results indicate that patients with male gender, those who had higher level of education and diabetes comorbidity, employed patients, those who had not hypertension, overweight, hypercholesterolemia and history of MI, those

who were not smoker and patients with higher level of income experienced better HRQOL although these differences were only statistically significant in education, income and body mass index (BMI) variables ( $P < 0.050$ ) (Table 4).

### Correlation

Presents the correlations of HRQOL with characteristics of patients were shown in table 5. The correlations were significant at BMI, education, employee, sex hypertension in total HRQOL of PCI group whiles for dimensions and total HRQOL in CABG group, income and education display significant correlation (Table 5).

**Table 3.** Changes in the MacNew Scale and its subscale's scores in coronary artery bypass graft (CABG) and percutaneous coronary intervention (PCI) group 2 years after revascularization (within-group comparison)

MacNew Scale	CABG		PCI	
	Mean ± SD	P	Mean ± SD	P
Total score				
After 6	45.32 ± 13.75	0.001	53.52 ± 15.63	0.016
After 24	51.36 ± 14.25		49.94 ± 16.46	
Emotional				
After 6	46.15 ± 16.12	0.122	53.75 ± 16.53	0.244
After 24	51.08 ± 16.94		51.36 ± 18.17	
Social				
After 6	45.29 ± 13.88	0.064	55.62 ± 16.75	0.025
After 24	50.44 ± 14.36		51.27 ± 17.77	
Physical				
After 6	46.19 ± 14.87	0.260	53.46 ± 17.32	0.007
After 24	49.49 ± 13.31		47.48 ± 18.04	

Paired Student's t-test; CABG: Coronary artery bypass graft; PCI: Percutaneous coronary intervention; SD: Standard deviation

**Table 4.** Linear regression analysis of coronary artery disease (CAD) patients 6 months after revascularization according to characteristics (n = 109)

Variable	Mean ± SD	Age	Sex	Education	Income	Employment	Smoking	Hypercholesterolemia	Hypertension	Diabetes	BMI	History of MI
Total MacNew Score	50.96 ± 15.48											
	Standard error	2.319	11.342	2.855	1.850	11.267	2.392	2.241	2.394	2.615	3.142	2.161
	Beta	0.021	-0.200	0.091	0.471	0.189	0.080	0.064	-0.105	0.112	-0.297	-0.011
	P	0.756	0.467	0.070	0.001	0.478	0.307	0.381	0.153	0.145	0.004	0.878
Emotional subscale	51.38 ± 16.71											
	Standard error	2.801	13.697	3.290	2.234	13.606	2.889	2.707	2.891	3.158	3.846	2.609
	Beta	-0.075	-0.258	-0.215	0.262	0.007	0.142	0.058	-0.055	0.096	-0.545	-0.053
	P	0.329	0.401	0.210	0.012	0.981	0.106	0.477	0.499	0.263	0.001	0.499
Social subscale	52.39 ± 16.55											
	Standard error	2.815	13.76	3.306	2.245	13.674	2.904	2.720	2.905	3.173	3.865	2.622
	Beta	0.044	-0.569	0.442	0.256	0.370	0.147	-0.074	-0.077	0.092	-0.354	0.072
	P	0.572	0.070	0.040	0.016	0.222	0.098	0.372	0.353	0.294	0.002	0.367
Physical subscale	51.55 ± 16.72											
	Standard error	2.858	13.975	3.518	2.279	13.883	2.948	2.762	2.949	3.222	3.924	2.662
	Beta	0.355	-0.349	-2.049	2.945	-0.113	1.664	-0.204	-1.694	0.920	-2.406	-0.134
	P	0.723	0.728	0.043	0.004	0.910	0.099	0.839	0.094	0.360	0.002	0.894

SD: Standard deviation; BMI: Body mass index; MI: Myocardial infarction

**Table 5.** Correlation of health-related quality of life (HRQOL) with characters

Variables	PCI				CABG			
	Emotional	Social	Physical	Total	Emotional	Social	Physical	Total
Age	0.026	0.074	0.136	0.059	0.092	0.294	0.274	0.213
Education	-0.092	0.122	0.159	0.265*	0.266	0.426*	0.507**	0.446*
Sex	-0.247	-0.172	-0.064	0.334**	0.172	0.312	0.263	0.229
Employee	-0.151	-0.080	-0.011	0.438**	0.172	0.312	0.263	0.229
Smoking	-0.018	-0.041	0.055	0.100	-0.135	0.113	0.086	-0.003
Hypertension	0.009	-0.107	-0.126	-0.236*	0.175	0.013	-0.052	0.093
Diabetes comorbidity	0.102	0.045	-0.016	-0.088	-0.017	0.113	0.128	0.086
BMI	-0.047	-0.033	-0.033	-0.373**	-0.083	-0.001	-0.062	-0.132
History of MI	-0.094	0.015	-0.003	-0.056	-0.233	-0.192	-0.208	-0.202
Income	0.209	0.177	0.190	0.015	0.374*	0.522**	0.555**	0.495**
Hypercholesterolemia	0.067	-0.021	0.045	0.014	0.052	0.044	-0.045	0.060

Pearson correlation coefficient; \* Correlation is significant at the 0.05 level (two-tailed); \*\* Correlation is significant at the 0.01 level (two-tailed); PCI: Percutaneous coronary intervention; CABG: Coronary artery bypass graft; BMI: Body mass index; MI: Myocardial infarction

## Discussion

In this study after proving similarity of patients in two groups in the aspect of socio-demographic and clinical characteristics, data analysis revealed that those who underwent PCI experienced significantly higher HRQOL in all dimensions of MacNew scale 6 months after revascularization but over 2 years follow-up there was not a significant difference between two groups. This finding is in agreement with results of a study that has been conducted recently by Loponen et al. to assess HRQOL after CABG and PCI in the management of stable CAD. They found that a 3 years survival was similar in the both groups and the HRQOL improved statistically in both groups until 6 months after treatment but deteriorated toward the end of the follow-up of 36 months. Despite initially more serious pre-operative morbidity, the CABG patients achieved an equal level of HRQOL when compared with PCI patients.<sup>12</sup>

The CAD imposes a high burden on communities in worldwide in terms of premature mortality, adverse effects on QOL and economic impacts on families and health systems.<sup>2,12,13</sup> It is evident that goal for the treatment of patients with the CAD is not just to prolong life but also to provide a better HRQOL. Therefore, the HRQOL has become an important measure of the outcome of care for patients with chronic diseases in the last two decades and it has also been found to be a predictor of health service utilization and mortality.<sup>14,15</sup> Hereupon, information on QOL of CAD patients in different modes of revascularization and its determinant is so important to defining a comprehensive plan of care.

Notwithstanding many studies have demonstrated that CABG and PCI provided a similar degree of protection against death and MI and shown that patients who undergo PCI are much more likely to have recurrent angina and to require repeat procedures<sup>16</sup> but few randomized trials have included HRQOL comparisons after PCI and CABG.

Our results in within-group analysis showed in both groups total MacNew scale and its subscales were changed significantly after 2 years. Norris et al. conducted other study to

compare risk-adjusted HRQOL in 3392 patients with 1 year follow-up. Their results revealed that responders undergoing CABG reported significantly better HRQOL in all but one Seattle Angina Questionnaire dimension compared with who had either a PCI with or without stent.<sup>13</sup> A similar finding has been detected in other study that evaluated change in HRQOL after cardiac rehabilitation among 2441 patients.<sup>17</sup> In general and based on a comprehensive study conducted by Bravata et al.<sup>18</sup> to assess comparative effectiveness of PCI and CABG for CAD-11 randomized trials included in final analysis-they concluded HRQOL scores improved to a significantly greater extent after CABG than after PCI between 6 months and 3 years of follow-up but equalized thereafter.

Our results showed in the whole sample of CAD patients 6 months after revascularization, those who had higher level of income and education and were not either overweight or obese experienced better HRQOL while other covariates were not significantly associated with HRQOL. Several studies have been shown that educational and socioeconomic status are closely associated with the HRQOL.<sup>19,20</sup> Interestingly, age and sex, which are well known as predictors of HRQOL perception,<sup>21,22</sup> were not found to be determinant for HRQOL in our study. In accordance with our results, Durmaz et al.<sup>23</sup> found that sex and age were not important determinant for HRQOL.

Regarding clinical variables, previous MI, diabetes comorbidity, hypertension, and hypercholesterolemia were not found to be an important determinant for HRQOL. Since a number of studies have reported clinical predictors of HRQOL in CAD such as peripheral vascular disease, hypertension, and MI.<sup>21,23,24</sup> It seems the effect of clinical variables on the perception of health status was somewhat unique in this study and merits further investigation.

Since some may argued that generic HRQOL measuring instruments are not able to illustrate impact of different treatment methods and disease's effect on HRQOL's dimension of patients, therefore we used the MacNew Heart Disease HRQOL because it incorporates

domains that address a patient's attitudes toward coronary disease with specific questions regarding disease-specific symptoms and their attitude toward the illness that this is a strength of our study.

However, there are several limitations of our study that need to be considered in interpreting results. However our patients in two groups were similar but it is important to consider the differences among patients carefully when treatment outcomes are analyzed. It is difficult for case-mix adjustments to account adequately for these differences in analyzing patients' outcome in relation to CABG and PCI method. Moreover, since this study was carried out in only one province, our sample may not be representative of whole patients with CAD. Nonetheless, we have noted the paucity of information regarding HRQOL in CAD patients, particularly about two main modes of coronary revascularization in developing countries.

### Conclusion

Our results showed that patients who underwent PCI experienced significantly higher HRQOL in 6 months after revascularization but over 2 years follow-up there was not a significant difference between two groups. Selecting an optimal method of coronary revascularization is a complex clinical decision-making process that needs clinicians incorporate a number of clinical factors, technical considerations, and patient preferences. Therefore in addition to clinical issues, patients' preferences for specific aspects of HRQOL should be considered and tradeoff must be discussed when informing patients about coronary revascularization choices.

### Acknowledgments

The authors would like to thank kindly all participants in the study. This work was supported partially by Tehran University of Medical Sciences, Iran.

### Conflict of Interests

Authors have no conflict of interests.

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**How to cite this article:** Yazdani-Bakhsh R, Javanbakht M, Sadeghi M, Mashayekhi A, Ghaderi H, Rabiei K. **Comparison of health-related quality of life after percutaneous coronary intervention and coronary artery bypass surgery.** *ARYA Atheroscler* 2016; 12(3): 124-31.