Original Article

Health-Related Quality of Life After Percutaneous Coronary Intervention Versus Coronary Artery Bypass Graft Among Iranian Patients

Behshad Naghshtabrizi[1], MD ; Nasrin Matinnia[2*], MSc, PhD; Ali Ghaleiha[3], PhD; Manoochehr Karami[4] MS, PhD; Vida Faramarzi[1], MD

ABSTRACT

Background: Choosing unsuitable therapeutic methods affects patients' quality of life. The present study aimed to compare quality of life between patients treated with coronary artery bypass graft surgery (CABG) and those treated with percutaneous coronary intervention (PCI).

Method: This cohort study sought to assess quality of life in 290 patients with 3-vessel or left main coronary artery disease, who were referred to Ekbatan Hospital, Hamedan, Iran, to undergo either CABG or PCI. Health-related quality of life was investigated at baseline and subsequently at 6 and 12 months postprocedurally with the 36-Item Short-Form Health Survey (SF-36). The patients' quality of life was evaluated based on a scoring system from 0 to 100, with higher scores representing a better health status. The primary outcomes were the physical component summary and mental component summary scores from the SF-36.

Results: The study results revealed a significant difference between the 2 groups regarding physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health at baseline as well as at 6 and 12 months after the procedures ($P < 0.001$). Moreover, a significant relationship was observed between the type of procedure and desired quality of life ($P < 0.05$), which was more significant for PCI. However, no significant relationship was found between quality of life and diabetes, hyperlipidemia, high-density lipoprotein level, cigarette smoking, and the body mass index ($P > 0.05$).

Conclusions: Our investigation of quality of life in the CABG and PCI groups using the SF-36 questionnaire revealed that quality of life was better in the PCI group.***(Iranian Heart Journal 2017; 18(4):48-54)***

KEYWORDS: Quality of life, Coronary artery bypass graft, Percutaneous coronary intervention

[1] Farshchian Heart Center, Hamedan University of Medical Sciences, Hamedan, IR Iran.
[2] Department of Nursing, College of Science, Hamedan Branch, Islamic Azad University, Hamedan, IR Iran.
[3] Research Center for Behavioral Disorders and Substance Abuse, Hamadan University of Medical Sciences, Hamedan, IR Iran.
[4] Department of Epidemiology, Hamedan University of Medical Sciences, Hamedan, IR Iran.

*** Corresponding Author:** Nasrin Matinnia, MS, PhD; Department of Nursing, College of Science, Hamedan Branch, Islamic Azad University, Hamedan, IR Iran.
Email: nmatinniach@gmail.com **Tel:** 09181116026

Received: August 19, 2017 **Accepted:** November 14, 2017

In 2010, cardiovascular diseases caused an estimated 16 million deaths and led to 293 million disability-adjusted life-years lost. [1] Consequently, these diseases imposed a large number of problems on patients and inflicted high costs on societies the world over. To date, different invasive methods such as coronary artery bypass graft surgery (CABG) and percutaneous coronary intervention have been used to treat coronary artery disease. [2] Several studies have shown similar mortality rates after PCI and CABG; however, their results have also demonstrated that the patients who underwent PCI experienced more recurrent chest pain necessitating re-intervention. In some patients, physicians cannot find a clear advantage for either CABG or PCI, and revascularization procedures are based solely upon technical aspects and procedural risks. Still, it seems that ischemia is more completely eliminated with surgery, and patients may derive a greater health-related quality of life (HRQL) through CABG than through PCI. In the pre-stent era, multiple studies that compared CABG to balloon angioplasty and evaluated HRQL showed that CABG patients had more improvement in HRQL scores. [3–5] On the other hand, AWESOME reported similar 6-month HRQL for PCI and CABG. [6] Overall, patients' postprocedural quality of life—including physical functioning—should be an equally important consideration in the decision-making process. Consequently, it is important to compare HRQL outcomes after PCI with those following CABG because any significant difference may influence the choice of the revascularization procedure. Currently, however, limited data are available to describe patients' health status after either revascularization technique, and these studies have had conflicting results. Thus, clinicians are unable to incorporate this information when recommending a treatment strategy to their patients. [7, 8]

Up to now, some researchers have compared PCI and CABG and indicated significant advantages for CABG compared to PCI. The prevalence of coronary artery disease is on the rise in Iran; this increase has impacted patients' lives functionally, mentally, and socially. Opting for unsuitable therapeutic methods imposes a heavy financial burden on both individuals and the health-care system, affects patients' quality of life, and significantly lowers their efficiency. Thus, it seems that paying sufficient heed to patients' quality of life after therapeutic interventions (PCI/CABG) and choosing suitable therapeutic methods have prompt effects in terms of improving patients' survival and quality of life. If the type of the therapeutic method is effective in individuals' quality of life, the appropriate selection of the type of procedure is of great importance too. To our knowledge, no studies have thus far compared quality of life changes pertaining to PCI and CABG in Iran. Therefore, in the current study we aimed to investigate this issue in the Iranian province of Hamedan.

METHOD

A total of 290 patients were assigned to undergo either CABG (n =145) or PCI (n = 145) as an initial treatment strategy. This cohort study was conducted on 2 groups of individuals referred to Ekbatan Hospital, Hamedan, Iran, for PCI or CABG according to their selective coronary angiography results. Luminal narrowing equal to or greater than 70% was considered significant in the left anterior descending, left circumflex, and right coronary arteries. The choice of PCI or CABG was left to the cardiologist's discretion and in accordance with the current guidelines, anatomy of the vessel, and the patient's condition. The inclusion criteria of the study were age 50 years old or above and candidacy for CABG or PCI. On the other hand, the exclusion criteria were comprised of suffering from psychological, rheumatological, and endocrine disorders that could affect the patients' quality of life.

PCI was performed using standard interventional techniques. The diameter and the

length of the lesions were assessed by 2D quantitative coronary angiography. The size and type of the selected stents for each patient were at the discretion of the interventionist performing the procedure according to the latest guidelines of the European Society of Cardiology. In the patients undergoing CABG, the left internal mammary artery was inserted on the left anterior descending artery and, if needed, saphenous vein grafts were inserted on the left circumflex artery and the right coronary artery. First, median sternotomy was performed and the left internal mammary artery was harvested (pedicled graft) from the musculophrenic and superior epigastric arteries up to the upper margin of the first rib or higher. In some cases, saphenous veins were harvested from 1 or both legs. After systemic heparinization, aortic cannulae and 2-stage venous cannulae were introduced. Cardiopulmonary bypass was initiated using cardioplegia. Afterwards, the left internal mammary artery and the saphenous veins were anastomosed with 8-0 and 7-0 Prolene.

Prior to the commencement of the study, written informed consent was obtained from all the patients. General health status was measured in the study population using the 36-Item Short-Form Health Survey (SF-36). The SF-36 was derived from the General Health Survey of the Medical Outcomes Study by Stewart and colleagues [9] (1988). The SF-36 has been previously translated into Farsi, and its reliability (.87) and content validity (.85) have been assessed. [10–12] The SF-36 evaluates 8 dimensions of health: physical functioning, role limitations due to physical problems, bodily pain, vitality, general health perception, social function, role limitations due to emotional problems, and mental health. Scores for each subscale range from 0 to 100, with higher scores indicating a better health status. Furthermore, the SF-36 provides 2 summary scales for overall physical and mental health with a mean of 50 and a standard deviation of 10. (Higher scores indicate a better health status.) The SF-36 is one of the most widely used measures of HRQL, and it has sensitivity to important treatment outcomes in a variety of patient populations. [9]

This questionnaire was completed by our 2 study groups before the therapeutic procedure to make an assessment of the patients' quality of life before the procedures possible. The patients' phone numbers and addresses were recorded, as well. After 6 and 12 months, the SF-36 questionnaire was completed by the patients. The patients' quality of life was evaluated based on a scoring system.

All the analyses were performed using SPSS. The baseline characteristics were compared between the 2 groups using the T-test for the continuous variables and the χ^2 test for the categorical variables. For the primary analysis, the mean quality-of-life scores were compared between the 2 groups at each time point by means of the analysis of covariance in order to adjust for the baseline scores. All tests of statistical significance were 2-tailed. A *P* value less than 0.05 was considered statistically significant.

RESULTS

This study was conducted on patients assigned to 2 equal groups undergoing CABG or PCI. The baseline characteristics of the respondents are compared between the PCI and CABG surgery cohorts in Table 1.

Table 1. Baseline characteristics and major risk factors of the patients

Characteristic	PCI (n=145)	CABG (n=145)	*P*
Age (y)	61.2± 8.7	63.00± 9.4	NS
Male sex (%)	64.1	66.2	NS
Hypertension (%)	57.2	69.7	.03
Diabetes mellitus (%)	22.1	23.4	NS
Hyperlipidemia (%)	26.2	20.7	NS
Cigarette smoking (%)	33.1	35.9	NS
BMI(Mean± SD)	24.9 ±3.3	26.2± 2.7	.004

PCI, Percutaneous coronary intervention; CABG, Coronary artery bypass graft surgery; BMI, Body mass index

The mean age of the study population was 62 years and 64.8% were men. At baseline, both

groups of patients reported significant health status limitations attributable to coronary artery disease. There were no significant differences in the demographics and major risk factors between the PCI and CABG groups. Nonetheless, the body mass index and hypertension were significantly different between the 2 groups.

The results showed no significant relationship between age, sex, cigarette smoking, diabetes, hyperlipidemia, high-density lipoprotein level, and quality of life ($P > 0.05$). Thus, these variables had no significant impacts, although quality of life and hypertension had a significant relationship ($P = 0.03$).

The unadjusted physical and mental health status outcomes are compared between the PCI and CABG groups in Table 2. The physical or mental health status outcomes were not significantly different between the PCI and CABG cohorts. There were no significant differences in the physical component summary or the mental component summary scores vis-à-vis age, sex, smoking, diabetes, hyperlipidemia, and hypertension in the subgroup analyses.

At 6 months, the scores on the physical and mental component summary were higher in the PCI group than in the CABG group ($P < 0.001$ for all comparisons).

The scores on the quality-of-life subscale were higher in the PCI group than in the CABG group at 6 and 12 months; nonetheless, the differences were less considerable after 12 months than at 6 months (Table 2).

Table 2. Adjusted effects of CABG versus PCI on the disease-specific and general measures of health status according to longitudinal analysis *

SF-36 Scales Physical-Health Outcome	Baseline	*P*	6 Months	*P*	12 Months	*P*
Physical functioning	−2.2 (−4.5 to 0.0)	NS	−22.3 (−36.73 to – 26.7)	<0.001	−14.3 (−16.7 to −11.9)	<0.001
Role-physical	−1.9 (−4.3 to 0.5)	NS	−31.2 (−24.8 to −20.0)	<0.001	−10.8 (−12.9 to −8.7)	<0.001
Bodily pain	2.1 (0.2 to 4.4)	NS	−25.3 (−26.8 to−21.5)	<0.001	−11.5 (−14.4 to −8.7)	<0.001
General health	−1.4 (−3.2 to 0.4)	NS	−13.8 (−27.9 to −22.8)	<0.001	−5.4 (−7.3 to −3.5)	<0.001
Physical component summary	−2.0 (−5.1 to 1.1)	NS	−10.2 (−12.0 to −8.3)	<0.001	−7.7 (−8.6 to −6.8)	<0.001
Mental health outcome						
Vitality	0.6 (−1.4 to 2.5)	NS	−10.8 (−12.9 to −8.7)	<0.001	−3.3 (−4.7 to −1.9)	<0.001
Social functioning	0.8 (−1.3 to 3.0)	NS	−24.0 (−26.8 to −21.5)	<0.001	−5.0 (−7.3 to −2.7)	<0.001
Role-emotional	−1.9 (−4.3 to 0.5)	NS	−12.6 (−14.7 to −10.6)	<0.001	−4.0 (−6.7 to −1.4)	<0.001
Mental health	−0.4 (−1.9 to 1.1)	NS	−12.1 (−14.6 to −9.7)	<0.001	−5.4 (−7.3 to −3.5)	<0.001
Mental component summary	−0.4 (−1.3 to 0.5)	NS	−9.4 (−13.0 to −5.9)	<0.001	−3.2 (−4.3 to −2.1)	<0.001

NS, Not significant

According to Table 2, quality of life in the individuals who underwent PCI was more desirable. Random-effect growth-curve models were used to analyze the treatment effects, which are stated in the above table as adjusted differences with 95% confidence intervals in parentheses. Positive values indicate a better health status with CABG, and negative values indicate a better health status with PCI.

DISCUSSION

The current study evaluated quality of life in 2 groups of patients who underwent PCI or CABG using the SF-36 questionnaire before and after the procedures. Based on the study results, quality of life was better in the PCI group than in the CABG group.

Cohen et al [13] evaluated quality of life in 1800 patients (897 patients who underwent CABG and 903 patients who underwent PCI). HRQL was assessed at baseline and at 1, 6, and 12 months using a self-assessment questionnaire (SAQ) and the SF-36. The primary end point was the score of the angina-frequency subscale of the SAQ, on which, the scores ranged from 0 to 100—with higher scores indicating a better health status. Based on the results, the proportion of the patients who were free from angina was similar in the 2 groups at 1 month and 6 months, whereas it was higher in the CABG group than in the PCI group at 12 months (76.3% vs 71.6%; $P = 0.05$). The scores of all the other SAQ and SF-36 subscales were either higher in the PCI group (mainly at 1 month) or were similar in the 2 groups throughout the follow-up period. The results of that study chime in with the results of our study.

Borkon et al [14] analyzed and compared patients' health status after PCI and CABG using a SAQ. In that study, the SAQ was administered before the procedures monthly for 6 months and then at 1 year. Over the 12-month follow-up period, health status improved to a greater extent for the CABG patients than for the PCI ones primarily due to the adverse influence of restenosis after PCI. Moreover, 83% of the patients who underwent PCI received stents and the rest received balloon angioplasty alone. It should be mentioned that the drug-eluting stents were not marketed at that time. These were the main differences between that study and the present one.

Furthermore, Arnold et al [15] studied patients with 3-vessel or left main coronary artery disease who were randomized to CABG or PCI with paclitaxel-eluting stents. Health status was assessed at baseline and at 1, 6, and 12 months using a SAQ and the Medical Outcomes Study Short-Form General Health Survey. In addition, the association between repeated revascularization and health status during the follow-up period was assessed using longitudinal models. Among the patients with multi-vessel coronary artery disease treated with PCI or CABG, the occurrence of repeated revascularization during the follow-up period did not fully explain the anti-anginal benefit of CABG in the overall population. The authors concluded that the differential association between repeated revascularization and anginal status, according to the type of the initial revascularization procedure, suggested that this end point should play a limited role in any direct comparison of the 2 treatment strategies. In the current study, only quality of life was taken into account, whereas some other points such as the need for new revascularization and level of angina relapse were considered in the aforementioned research.

In another study carried out by Rittger et al [16] on 300 patients, 56 out of the 95 (59%) PCI patients were at most 75 years old and 39 (44%) patients were older than 75 years. On the other hand, 155 out of the 205 patients (76%) in the CABG group were at most 75 years old and 50 (24%) patients were older than 75 years. Indeed, the mean follow-up time was 312 ± 226 days in the PCI group and 377 ± 286 days in the CABG group. The results showed no significant difference among the 4 groups regarding the rates of death and myocardial infarction at the end of the follow-up. Additionally, the authors reported no significant difference between the study groups with respect to quality of life after 6 months. The method of patient selection in that study was completely different from that in the present study: Rittger and colleagues selected patients with significant left main stenosis, which was not an inclusion criterion in our investigation.

Van Domburg et al [17] performed a relatively unique study to evaluate HRQL in patients randomized to stenting versus CABG at baseline and at 1, 6, 12, and 36 months after revascularization using the SF-36 questionnaire. Both stenting and CABG resulted in significant improvement in HRQL and anginal status. Although there was a trend

for a better HRQL after CABG up to 1 year, the disparity between the 2 procedures decreased in the long run. Most of the differences between the 2 procedures were attributed to repeated interventions in the stent group; 19% of the stent patients versus 13% of the CABG patients (P <0.0001) had undergone a repeated intervention at 3 years. In that study, the follow-up period was longer than that in the current study. Additionally, our study did not evaluate the need for repeated intervention but disclosed a better quality of life in the PCI group at 1 year's follow-up.

In the research by Bonaros et al, [18] 56 out of the 120 patients who had received robotically assisted CABG were operated on using standard sternotomy. These patients were compared to 55 patients who had undergone totally endoscopic coronary artery bypass grafting (TECAB) and 9 TECAB patients who required conversion to conventional sternotomy. Quality of life was evaluated using the SF-36 and a standardized questionnaire before and 1, 3, and 6 months after the procedure. According to the results, TECAB using robotic technology conferred improvement in physical health, shorter hospital length of stay, and more rapid restoration of daily activities. Moreover, conversion from TECAB to sternotomy did not impair quality of life compared to primary sternotomy. Although that study did not compare quality of life between CABG and PCI patients, it showed better results with the less invasive procedure.

CONCLUSIONS

In the current study, quality of life was evaluated in 2 groups of patients undergoing PCI or CABG in Ekbatan Hospital using the SF-36 questionnaire at baseline and then at 6 months and 12 months after the procedures. The study questionnaire assessed physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The results indicated that the condition of the PCI group was better than that of the CABG group within 6 and 12 months after the procedures.

Conflict of Interest: Authors have no conflict of interest to declare.

Acknowledgements

This study was adapted from an MD thesis at Hamadan University of Medical Sciences.

REFERENCES

1. Mathers C, World Health Organization, "The Global Burden of Disease: 2004 update," 2004 Updat., 2008, p. 146. https://books.google.com/booksWorld+Health+ Organization, Global +Burden +of+ Disease: +2004+update

2. Mann D L, Zipes D P ,Libby P, and Bonow R., Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, Tenth. Philadelphia: Elsevier, 2015;p 115-119.

3. https://books.google.com/books, Braunwald Heart Disease A Textbook ofCardiovascular Medicine, Tenth. Philadelphia: Elsevier, Rosenheck R A, Perkins D O, Keefe R S, Davis S M, Davis C E, Lebowitz B D, and Severe J, "Effect of PCI on Quality of Life in Patients with Stable Coronary Disease," New Engl. J., 2005; 359(7) :pp 1209–1223.

4. Weintraub W S, Spertus J A, Kolm P, Maron D J, Zhang Z, Jurkovitz C , Zhang W, Hartigan P. M, Lewis C, Veledar E, Bowen J, Dunbar S B, Deaton C, Kaufman S, O'Rourke R A, Goeree R, Barnett P G, Teo K K, and Boden W E, "Effect of PCI on Quality of Life in Patients with Stable Coronary Disease," N Engl J Med. August 2008; 359:677-687. http://dx.doi.org /10.1056/NEJMoa072771, 2009.

5. Raspovic K M. and Wukich D K. "Self-reported quality of life in patients with diabetes: a comparison of patients with and without Charcot neuroarthropathy.," Foot ankle Int. 2014 ; 35(3): pp. 195–200.

6. Rumsfeld J S, Magid D J, Plomondon M E, Sacks J, Henderson W, Hlatky M, Sethi G, and Morrison D A. "Health-related quality of life

after percutaneous coronary intervention versus coronary bypass surgery in high-risk patients with medically refractory ischemia," J. Am. Coll. Cardiol. 2003; 41(10): pp. 1732–1738

7. Wijeysundera H C, Qiu F, Fefer P, Bennell M C, Austin P C, and Ko D T. "Association between appropriateness of coronary revascularization and quality of life in patients with stable ischemic heart disease," BMC Cardiovasc. Disord. 2014 Dec; 14(1): p. 137.

8. Soo Hoo S. Y, Gallagher R, and Elliott D. "Field triage to primary percutaneous coronary intervention: Factors influencing health-related quality of life for patients aged ≥70 and <70 years with non-complicated ST-elevation myocardial infarction," Hear. Lung J. Acute Crit. Care. 2016 Jan; 45(1): pp 56–63.

9. Ware J. E, and Sherbourne C D. "The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection.," Med. Care. 1992 Jun.; 30(6): pp 473–83.

10. Mehraban D, Naderi, G, and Salehi, M. "Development of SF-36 Questionnaire in the Measurement of Quality of Life in Patients on Renal Replacement Therapy in Iran.," Saudi J. Kidney Dis. Transpl. 2003; 14(1): pp 15–7.

11. Motamed N, Ayatollahi A R, Zare N, and Sadeghi-Hassanabadi A. "Validity and reliability of the Persian translation of the SF-36 version 2 questionnaire.," East. Mediterr. Heal. J. = La Rev. santé la Méditerranée Orient. = al-Majallah al-ṣiḥḥīyah li-sharq al-mutawassiṭ. May 2005; 11(3): pp 349–57.

12. Montazeri A, Goshtasebi A, Vahdaninia M, and Gandek B. "The Short Form Health Survey (SF-36): translation and validation study of the Iranian version.," Qual. Life Res. Apr 2005; 14(3):pp 875–82.

13. Cohen D. J, Van Hout B, Serruys PW, Mohr F W, Macaya C, den P H, Vrakking. M M, Wang K, Mahoney E M, S. Audi D S, Leadley K, Dawkins K D, and Kappetein A P. "Quality of Life after PCI with Drug-Eluting Stents or Coronary," N. Engl. J. Med. 2011; 364(11): pp 1–11.

14. Borkon A M, Muehlebach G F, House J, Marso S P, and Spertus J A, "A comparison of the recovery of health status after percutaneous coronary intervention and coronary artery bypass," Ann. Thorac. Surg. 2002 74(5): pp 1526–1530.

15. Arnold S V, Magnuson E A, Wang K, Serruys P W, Kappetein A P, Mohr F W, and D. Cohen J. "Do Differences in Repeat Revascularization Explain the Antianginal Benefits of Bypass Surgery Versus Percutaneous Coronary Intervention?: Implications for Future Treatment Comparisons," Circ. Cardiovasc. Qual. Outcomes. May 2012; 5 (3):pp 267–275.

16. Rittger H, Rieber J, Kögler K, Sinha A, Schmidt M, Breithardt OA , Biggar P, Einsle F, Diegeler A, and Brachmann J. "Clinical outcome and quality of life after interventional treatment of left main disease with drug-eluting-stents in comparison to CABG in elderly and younger patients," Clin. Res. Cardiol. May 2011; 100(5):pp 439–446.

17. Van Domburg R T, Daemen J, Pedersen S S, Bressers M, Van Herwerden L A, Firth B G, Unger F, and Serruys P W. "Short-and long-term health related quality-of-life and anginal status after randomisation to coronary stenting versus bypass surgery for the treatment of multivessel disease: results of the Arterial Revascularisation Therapy Study (ARTS)," EuroInterv. 2007; 3:pp 506–511.

18. Bonaros N, Schachner T, Wiedemann D, Oehlinger A, Ruetzler E, Feuchtner G, Kolbitsch C, Velik-Salchner C, Friedrich G, Pachinger O, Laufer G, and Bonatti J. "Quality of Life Improvement after Robotically Assisted Coronary Artery Bypass Grafting," Cardiology. Apr. 2009; 114(1):pp 59–66.