

Assessment of Psychological Factors, Erectile Dysfunction, and Quality of Life before and after Revascularization Procedures

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Abstract

The purpose of the present study was to examine the relationship between psychological factors, Erectile Dysfunction (ED) and Quality of Life (QoL) before and after Coronary Artery Bypass Graft (CABG) and Percutaneous Transluminal Coronary Angioplasty (PTCA) procedures, in an Iranian sample of cardiovascular patients. To do so, one hundred ninety patients scheduled for CABG and PTCA operations were selected and administered relevant questionnaires a day before the surgery. Subsequently, the same patients filled out the same questionnaires two months following the procedure. Data analysis showed an increase in QoL while revealing a decline in men's sexual functioning after the PTCA procedure although no change was observed in women. Also, an improvement in psychological status of all patients was observed following both revascularization procedures.

Keywords: Revascularization; Quality of Life (QoL); Erectile dysfunction

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Introduction

People with Coronary Artery Diseases (CAD) suffer from angina, shortness of breath, fatigue and dizziness with or without the onset of physical activity, and experience a diminished ability to perform the usual activities of daily living. There are safe and effective methods used in the treatment of coronary artery disease are Coronary Artery Bypass Grafting (CABG) and Percutaneous Transluminal Coronary Angioplasty (PTCA). The CABG is a procedure that not only diminishes the negative effects of coronary artery disease and reduce the risk of further damage to the heart (i.e., myocardial infarction or congestive heart failure), but also improves patient's health related Quality of Life (QoL). The PTCA is also a beneficial procedure to alleviate symptoms resulting from coronary artery blockage. In this procedure, special tubing with an attached deflated balloon is threaded up to the coronary arteries. The balloon is then inflated in order to enlarge areas where blood flow to the heart muscle has been blocked or reduced. Similar to the CABG, QoL has also been reported to improve following the PTCA procedure [1].

Although a number studies have reported that patients' health-related QoL improve after CABG [2] and PTCA [3], operated patients, in addition to experiencing many physical problems and relative disabilities such as Erectile Dysfunction (ED) [4,5],

report array of psychiatric disorders, namely depression, anxiety, cognitive functions, and sleep disorders [6]. For example, Pignay-Demaria et al. [7] have equated the importance of the effects of such disorders, on the cardiovascular system to those of smoking and hypertension, thus, stressing the need for their early detection and treatment. They have also pointed out that these psychological disorders can exacerbate treatment outcomes following an intervention treatment procedure which lead to a marked decrease in quality of life.

In addition to psychiatric disorders, CABG and PTCA may impact cognitive functioning. For example, Bergh et al. [8] have reported that patient's undergoing the CABG and PTCA treatment experience significant deterioration in memory 1 to 2 years following the operation. Moreover, Ahlgren et al. [9] in a study to evaluate and compare neurocognitive function and driving performance after CABG and PTCA, concluded that although a decline in cognitive functioning was evident in both groups, it was more severe in the CABG group than in the PTCA group.

Another problem associated with CABG and PTCA procedures is the development of sleep disturbances. Nisha et al. [10], for example, in a study of patient's successfully undergone percutaneous coronary intervention (PCI), reported sleep

disturbances. Also, Edéll-Gustafsson and Hetta [11] have shown patients undergone PTCA, one year after the procedure, exhibit fragmented sleep because of psycho-physiological symptoms associated with this procedure. Obviously, lack of sleep or poor sleep quality can cause great emotional distress and reduced-energy in cardiac patients undergone various revascularization procedures, and can significantly impede their recuperation process which ultimately decreases their QoL.

As mentioned before, one physical problem that can develop following treatment intervention procedures is ED. By definition, the inability to achieve or maintain an erection required for satisfactory sexual performance is called erectile dysfunction [12]. Psychogenic factors that cause ED include anxiety and depression, among others. For instance, Althof [13] has reported that ED is strongly associated with anxiety, depression, marital conflicts and relationship problems. Laumann et al. [14] have also noted that health status, stress, life satisfaction, deterioration of general health and emotional functions are strongly correlated with sexual dysfunction. Furthermore, Idung et al. [15] have concluded that social relationship and psychosocial well-being domains of QoL of men with ED are particularly impaired [16,17]. As such, ED is considered a major QoL issue, and indeed, a major health indicator, particularly in individuals with cardiac problems.

The results of studies examining the impact of treatment intervention procedures on ED are contradictory. For example, Akbulut et al. [18] reported that following CABG operation ED improves, thereby; enhancing QoL of the afflicted patients suggesting that ED is an essential component of QoL and that coronary artery bypass surgery can have considerable influence on erectile function. Similarly, Heaton et al. [19] have cited significant improvement following CABG. On the other hand, Foruzan-Nia et al. [20] have reported that the rate of sexual dysfunction increases from 20.1% prior to the surgery to 76.4% after the procedure. Therefore, it appears that CABG procedures do not necessarily enhance ED and that other factors are involved in the enhancement of ED after the operation.

Reports are also contradictory and scant regarding the effects of PTCA on ED. In one study, Karkos et al., showed that none of the patients undergone PTCA developed ED. Yet, the results of another study indicated that 64% of the patients, eight years after undergoing PTCA, experienced more satisfaction with their sexual functioning than before the procedure [21]. Therefore, no clear and concrete conclusion can be drawn about the effects of this procedure and its ensuing effects on ED.

Because of the false perception of cardiac surgery being a life threatening procedure, a great deal of stress and anxiety can develop before and after the intervention. For example, Chaudhury et al. [22] have reported a high prevalence of anxiety and depression in patients undergoing CABG, both before and after surgery. Furthermore, Rymaszewska et al. [23] have noted high levels of depression and state trait anxiety before the CABG that appear to be predictors of postoperative psychological outcome. Additionally, Krannich et al. [24] have found different levels of anxiety and depression before and after CABG depending on the age of the patient.

Similar reports have also been made regarding the PTCA procedure. Specifically, Zhao et al. [25] have reported high prevalence of anxiety and depression rates in patients undergoing PCI, compared to the general population. They maintain that the reduction in anxiety and depression levels from pre to post PCI indicates that patients are under tremendous psychological strain before PCI. Also, Astin et al. [26] have stressed the need for measuring anxiety and depression following the PTCA intervention given that preoperative anxiety and depression can negatively influence postoperative recovery.

Regarding the assessment of psychological status and the QoL of patients before and after CABG and PTCA, data is very scarce. In this regard, only one study was found in which QoL, mood state and physical functioning of patients were compared in both groups pre and post-operatively. In this study, Papadantonaki et al. [27] reported that mood state and physical functioning improved following both procedures while QoL was similar in both groups, before the operation and did not change after both procedures.

In sum, cardiac patients requiring revascularization procedures tend to perceive these procedures as a life threatening event that can cause a great deal of psychological burden on them. These problems are closely tied into other aspects of their lives such as ED which is a major health indicator and is considered a major element of QoL. As such, the present study attempts to address the interrelationship between psychological factors, ED and QoL, both, before and after CABG and PTCA procedures, in an Iranian sample of cardiovascular patients. To this end, the following questions will be addressed:

1. What is the relationship between psychological factors and QoL in patients undergone CABG and PTCA before and after the surgery?
2. Are there any gender differences in sexual functioning before and after CABG and PTCA?
3. What is the psychological status of men and women before and after CABG and PTCA?

Materials and Methods

Participants

The average age of participants was 60.45 (\pm 3.4) years old. One hundred eighty patients who referred to Baqiatallah and Tehran Heart Center hospitals for CABG and PTCA operations were randomly selected. Criteria for entering the study included: (1) CAD treated with elective CABG or PTCA, (2) age less than 70 years old, and (3) ability to fill out questionnaire. Following preliminary stages of admission to the hospital and obtaining patients' informed written consent, patients in CABG (n=90) and PTCA (n=90) groups were administered relevant questionnaires one day prior to their surgeries. Specifically, during the pre-test period patients were asked to answer relevant questionnaires to assess anxiety, depression and stress (DASS-21), QoL (Short Form of Health Survey, (SF-36), ED in women (Female Sexual Function Index (FSFI), and ED in men (IIEF). The same procedure was repeated, with the same patients, two months following

the surgery. Eventually, data were obtained from a total of one hundred-fifty subjects. Specifically, in the CABG group, one subject died, five patients had post-operation complication (stroke) and ten did not return questionnaires ($n=74$). Similarly, in the PTCA group, three patients had unsuccessful procedures, eight did not return questionnaires, and three opted to discontinue their participation ($n=76$).

Statistical analysis

Statistical analyses were performed by SPSS for windows 18.0 (SPSS, Chicago, IL, USA). Data were analysed using Pearson's correlation and paired t-test.

Assessment of QoL

QoL was assessed by means of the Short Form Health Survey (SF-36) questionnaire, which is a reliable and valid instrument for assessment of QoL in older people. The SF-36 includes 8 subscales namely: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). Scores range from 0 to 100 for each subscale with higher scores indicating a better condition. The questionnaire was normalized in Iran by Montazeri et al. [28] and its Test-retest correlation coefficient (with an interval of 14 days) was significant with $r=0/76$ and $P=0/0006$.

Assessment of erectile dysfunction in men

To assess men's erectile dysfunction, the abridged form of The International Index of Erectile Function (IIEF-5) questionnaire, a multi-dimensional self-report ordinal instrument, where lower values indicate lower sexual function, was used. Reliability of this questionnaire in the present population was obtained using a test-retest procedure within a 30-day time interval. The Cronbach's alpha was 0.82 which is indicative of its high reliability. The subjects' ED was measured and categorized according to severity based on their IIEF score: Severe dysfunction (score 5-10); mild to moderate dysfunction (score 11-15); mild dysfunction (score 16-20); and no dysfunction (score 21-25).

Assessment of erectile dysfunction in women

To assess female sexual dysfunction (FSFI) was used. This is a brief questionnaire designed to measure sexual functioning in women with a specific focus on sexual arousal, orgasm, satisfaction, and pain. The questionnaire, assessing sexual functioning with 19 questions, consists of six sexual domains; sexual desire (questions 1 and 2), arousal (questions 3-6), lubrication (questions 7-10), orgasm (questions 11-13), satisfaction (questions 14-16) and degree of pain (questions 17-19) during intercourse. For each six domains, a score is calculated and the total score is obtained by adding the six domain scores. The validity of each six domains, sexual desire, arousal, lubrication, orgasm, satisfaction and degree of pain, was assessed in an Iranian population, which were 0.7, 0.9, 0.9, 0.91, 0.76 and 0.88, respectively [29]. The Cronbach's alpha was reported as 0.85 which is indicative of its high reliability. The total score range is 2-36. A total score of >25 is considered normal female sexual function and a total score <25 is considered sexual dysfunction [30].

Assessment of anxiety, depression and stress

The Depression Anxiety Stress Scale-DASS-21 [31] is a 21-item self-report measure that provides continuous scores on three subscales of depression, anxiety and stress, recorded for the past week. Items are scored from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). High levels of severity on this measure are indicated by scores of 20, 14 and 26 or greater for depression, anxiety and stress, respectively. In the development of the measure, individual scales yielded Cronbach's alphas of 0.94 (depression), 0.87 (anxiety) and 0.91 (stress).

All questionnaires used in the present study were translated from English into Farsi (Persian) and, subsequently, back-translated into Farsi by an expert in the field who had a good command of the English language. As such, their validity and reliability were measured and were found to be adequate for use in our population.

The normality of data was determined by using Kolmogorov Smirnov test. All data were analysed at $p<0.05$ significance level.

Results

Table 1 illustrates the correlation between QoL and stress before and after PTCA and CABG procedures. As shown, the correlation coefficient scores before and after the PTCA ($r_b=-0.8$; $r_a=-0.56$) were transformed to Fisher's z score in order to compare stress and QoL, before and after the surgery. Results showed an inverse significant relationship between stress and QoL given that the obtained z score ($z=-2.67$) is greater than 1.96 ($p<0.05$, $z=1.96$) indicating that decreasing stress following PTCA causes an improvement in QoL. No significant relationship between anxiety and depression and QoL was evident in this group. Regarding the CABG, no significant relationship between psychological factors and QoL was observed.

Table 2 illustrates the comparison of mean scores of sexual functioning of men and women before and after CABG and PTCA procedures. Results of a paired t-test indicate a significant difference ($p<0.05$) in the mean scores of men's sexual functioning before and after PTCA while no significant difference was seen in women's sexual functioning. Regarding the CABG, no significant a difference in the mean scores of men's and women's sexual functioning was observed.

Table 3 illustrates psychological status of men and women before and after CABG surgery. A paired t-test was performed to determine the difference in the mean scores of psychological factors before and after surgery. According to this table, significant

Table 1 Correlation of quality of life and stress before and after PTCA and CABG procedures.

Stress QoL	Before	After
CABG	-0.696*	-0.695* (-0.01)
PTCA	-0.800*	-0.565* (-2.67)**

*Correlation was significant: $*p<0.05$; Numbers in parenthesis are Fisher's r to z transformation comparing correlation between QoL and stress before and after revascularization procedures. ** $p<0.05$ compared with pre-surgery values using r transformation to Fisher's z

differences ($p < 0.05$) were observed in men and women in all psychological factors prior to and following the surgery.

Table 4 illustrates psychological status of men and women before and after PTCA surgery. A paired t-test was performed to determine the difference in the mean scores of psychological factors before and after surgery. According to this table, significant differences ($p < 0.05$) were observed in men and women in all psychological factors prior to and following the surgery.

Discussion

The findings of the present study showed a significant increase in QoL due to a reduction in stress following the PTCA surgery. Also, our results showed sexual functioning in men decreased after the PTCA procedure while staying the same in women. Furthermore, in terms of psychological factors such as depression, anxiety and stress, our results showed that following both revascularization procedures, they were all reduced in participants.

The fact that QoL was increased as a result of a decrease in stress following successful PTCA is consistent with the findings of Blankenship et al. that reported an improvement of QoL following PTCA. One explanation for this finding is that the reduction of stress after PTCA could be due to the false perception of this surgery as being a life threatening procedure. Specifically, patients, at first,

Table 2: Comparison of sexual functioning of men and women before and after CABG and PTCA procedures.

Group Gender	CABG				PTCA			
	Before		After		Before		After	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Men	14.10	5.44	14.68	4.43	19.12	3.42	16.15	4.57*
Women	18.06	6.92	17.98	5.72	20.77	6.74	20.08	4.85

Post-surgery mean values were significantly different from those of pre-surgery (paired-samples t test): * $P > 0.05$

Table 3: Psychological status of men and women before and after CABG surgery.

Gender Variables	Men				Women			
	Before		After		Before		After	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Stress	17.78	5.61	11.21	4.28*	18.70	6.14	12.46	5.03*
Anxiety	12.86	3.66	9.18	3.32*	12.26	4.18	8.60	3.42*
depression	14.10	5.25	10.50	4.91*	15.16	5.36	10.50	4.60*

Post-surgery mean values were significantly different from those of pre-surgery (paired-samples t test): * $P > 0.05$

Table 4: Psychological status of men and women before and after PTCA surgery.

Gender Variables	Men				Women			
	Before		After		Before		After	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Stress	15.87	5.07	13.27	3.84*	15.03	5.21	11.48	4.24*
Anxiety	11.32	3.84	8.20	3.25*	11.06	3.62	7.19	3.20*
Depression	12.82	5.10	9.70	4.23*	11.48	4.90	8.87	4.37*

Post-surgery mean values were significantly different from those of pre-surgery (paired-samples t test): * $P > 0.05$

might have had a frightening view of the procedure and following the surgery they came to know about the less invasive nature of it, compared to that of CABG's, which led to the decline of their stress.

Regarding the sexual functioning of patients, our results indicated that men's sexual functioning worsened after the PTCA, while not changing after CABG, whereas in women there were no changes after either procedure. The fact that worsening of sexual functioning was observed in men after PTCA is supported by the findings of Karkos et al. [5] that noted the deterioration of sexual functioning following open and endovascular procedures. Wahrborg [31] also found no difference in the sex life of patients undergone PTCA. One explanation for our result might be related to a "false" and unrealistic expectation patients may have regarding their physical functioning as a whole before the operation. Specifically, they might mistakenly think that all aspects of their lives, including their sexual functioning, should and will improve once the surgery is completed.

On the other hand, in one study Lukarinen and Lukarinen, in an eight-year follow-up of sexual functioning of CABG and PTCA patients, reported an improvement in men's sexual satisfaction. As such, these contradictory reports might imply that sexual functioning in patients with CAD operations might be a "time-related" phenomenon which can vary with the passage of time. Specifically, it could be that improvement in sexual functioning requires long periods of time and since in our study this function was measured two months after the surgery, enough time was not given for its improvement therefore different outcome was observed. This finding can be clinically important in that sexual counselors and health psychologists can inform their patients of this fact in order to prevent the development of any false beliefs or expectations which can potentially cause them distress during the recuperation period following the surgery. As such, longitudinal studies are needed to explore this possibility.

In terms of the status of psychological factors in CABG and PTCA, the fact that depression, anxiety and stress decreased following successful operation is somewhat surprising given that a large body of evidence indicate an increase in psychological status of patients [32-35]. Nevertheless, our findings could imply that pre-operation emotional distress might simply be due to a lack of knowledge of the surgery and perceiving them as being a life threatening event. This finding can have implications for health psychologists and mental health professionals in those educating patients who are candidate for these surgeries about the nature of the procedure prior to the operation can have a significant impact on the health status of patients before the surgery and reduce their discomfort to a large extent. As such, educational sessions regarding revascularization procedures must be provided in order to ensure patients of the safety and effectiveness of these operations. In fact, the more knowledgeable the patients are about CHD, the more the possibility of addressing psychological issues will be. Furthermore, given that depression is linked to poor medical compliance (an essential behavior for patients undergone cardiac procedures to conform to) and other risk factors for cardiac heart diseases, the present results are important findings which can not only increase the QoL but also may reduce the rate of mortality and morbidity following the intervention.

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