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Original Article

Quality of Life of Patients Receiving Open Heart Surgery

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Abstract Health-related quality of life (HRQoL) has become increasingly important as the measure of treatment outcomes. Studies on HRQoL after an open heart surgery in Thailand are limited. The aim of this study was to evaluate the HRQoL improvements in terms of physical activity, physical and mental health, depression, cognitive function, chest pain after coronary artery bypass graft (CABG) and overall HRQoL at 3 and 5 months after the discharge from hospitalization for the heart surgery. Total of 122 adult patients were interviewed using a set of questionnaires before the operation, 3 months and 5 months thereafter. Several HRQoL measures including Duke Activity Status Index (DASI) [12 items], 9-THAI (Thai Health status Assessment Instrument) [8 items], Centers for Epidemiological Studies-Depression Scale (CES-D) [20 items], RAND cognitive function [6 items], Seattle Angina Questionnaire (SAQ) [4 items], and EuroQoL Visual Analogue Scale (EQ5D VAS) were used. The study was conducted at a tertiary care center of heart surgery in the northeastern region of Thailand, and data were collected during June 2006 to April 2007. The mean age of patients was 50.3 ± 13.6 years. HRQoL improvements after the surgery were reported as follows. The DASI scores increased by 8.6 ± 14.6 and 11.2 ± 14.4 at 3 and 5 months, respectively ($p < 0.001$). The 9-THAI physical score increased by 3.6 ± 22.4 ($p = 0.1$) and 10.1 ± 19.9 ($p < 0.001$) at 3 and 5 months. The 9-THAI mental score increased by 0.3 ± 22.9 ($p = 0.9$) and 4.9 ± 19.6 ($p < 0.01$) at 3 and 5 months. The CES-D score decreased by 2.3 ± 7.9 ($p < 0.01$) and 2.7 ± 7.6 ($p < 0.001$) at 3 and 5 months. The RAND cognitive function score increased by 3.6 ± 16.4 ($p < 0.05$) and 6.0 ± 16.2 ($p < 0.01$) at 3 and 5 months. The angina frequency score increased by 50.0 ± 30.7 and 52.5 ± 28.0 at 3 and 5 months ($p < 0.001$). The angina stability score increased by 43.7 ± 34.4 and 42.5 ± 35.7 at 3 and 5 months ($p < 0.001$). The treatment satisfaction score increased by 6.6 ± 3.2 ($p = 0.05$) and 5.6 ± 20.8 ($p = 0.1$) at 3 and 5 months. The overall HRQoL measure, EQ5D-based utility score increased by 8.6 ± 25.2 and 12.0 ± 24.2 at 3 and 5 months ($p < 0.001$). Patients who were undergone the success open heart surgery had the significant improvement in terms of physical health, mental health, cognitive function, clinical conditions, and overall HRQoL at 3- and 5-month follow-up after the surgery.

Keywords: DASI, health–related quality of life, open heart surgery, 9-THAI

INTRODUCTION

Cardiovascular event is an important burden of diseases in this era. In the year 2007, cardiovascular disease caused 40,000 deaths in Thailand. The open heart surgery including coronary artery bypass graft (CABG), valve surgery and congenital surgery are known to be the effective and regular treatment, since medications are aimed to relieve symptoms and to reduce the risk from heart attack.[1] There has been the increasing number of open heart surgery in Thailand that more than 10,000 procedures were performed in the year 2006. The Queen Sirikit Heart Center (QSHC) is the one of tertiary care centers for cardiac surgery in the north-eastern region of Thailand. Total of 1,133 open heart surgery procedures were performed at the QSHC during the year 2006.

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Medical outcomes in this era cover the wider range from cure or survival to patient-reported outcomes such as patients' satisfaction, patients' quality of life, and health care resource utilization.2 Health-related quality of life (HRQoL) provides the useful information that helps to understand patient's own perception of health. HRQoL usually integrates not only the functional and physical dimension of the disease, but also the psychological and social dimension.3 In addition, studies on HRQoL after an open heart surgery in Thailand are limited.

Since there was no recommended gold standard for measuring HRQoL in open heart surgery patients, then several HRQoL measures have been applied.[3-6] Though generic health measures can be used to compare across various diversity groups of subjects, but they might fail to the minimal important differences that arise as the consequences of study interventions.[7] Researchers then generally applied both generic and disease-specific HRQoL measures in the study.

The aim of this prospective study was to assess the benefit of open heart surgery patients in terms of physical health, mental health, and clinical condition as measured by using selected standardized generic and disease-specific HRQoL measures.

PATIENTS AND METHODS

Study Design

The study was a prospective study with repeated measurements of HRQoL. HRQoL of each patient was assessed three times including at enrollment before surgery, and after surgery by approximately 3 and 5 months after discharge from the hospital.

Sample

The study was conducted at the QSHC, Khon Kaen University, Thailand. During the period of study, 161 patients were admitted for the purpose of open heart surgery. The eligible patients were coronary artery disease (CAD), valve disease, or congenital heart disease patients who were aged 18 years or over. Patients who had full conscious and had no dyspnea condition were included. Patients who were unable to communicate in Thai were excluded. Patients were asked to give the written inform consent to participate in the study, and those who refused were excluded. Only 122 patients participated in the study.

Measurements

Data collection and all interviews were conducted by the researcher (TS). At baseline, data of HRQoL, socio-demographic characteristics, and clinical data including comorbidity, functional class—New York Heart Association (NYHA classification) were obtained.

The widely used measure of the degree of heart failure, NYHA scale was used. The NYHA is a 4-level ordinal scale ranged from 'no dyspnea' (class I) to 'dyspnea at rest' (class IV).[4,8]

The functional status was measured by using the Duke Activity Status Index (DASI), a 12-item scale score range of 0-58.2 (with higher score indicating better functional status). The DASI evaluates the ability to perform common activity of daily living.[9-11]

The Center for Epidemiologic Studies-Depression Scale (CES-D) consisting of 20 items was designed to measure symptoms of depression. Subjects rate the degree to which they experienced symptoms of depression. The CES-D scores range form 0-60, which higher scores indicating greater depressive symptoms. The CES-D scores of above 16 are considered to be the indicator of clinically significant depression.[5,12]

The 9-item Thai Health Assessment Instrument (9-THAI) is composed of seven domains and two global health ratings. Seven domains are 'mobility', 'self care', 'usual activities', 'illness/discomfort', 'anxiety/ depressed', 'cognition', and 'social functions'. Only one global health question was selected to include in this study. The global health question is the health transition question that asked subjects to compare their present health with the others. The scores of all items were coded such that higher scores reflect better health.[13,14]

The RAND cognitive function battery consists of 6 items. The measure assessed cognitive function in terms of how to feel, how things have became confused, reached slowly to thing, had difficult reasoning, was forgetful, had trouble keeping attention, had difficult concentration. Scale scores range from 0 to 100 that high scores indicating better health.[5]

The Seattle Angina Questionnaire (SAQ) measures 5 unique dimensions of coronary artery disease. Each scale scores range from 0 to 100, and no summary score is generated. The SAQ is the disease specific measure, thus it is more sensitive to important clinical changes. Only three aspects of CAD including angina stability, angina frequency, and treatment satisfaction were selected in this study. It is well standardized and has been shown to be a valid measure of quality of life in patients with CAD.[15,16]

The EuroQoL Visual analogue scale (EQ5D VAS) has been found to be valid, reliable and sensitive measure of change of subject conditions.[17,18] The scale ranges from 1 to 100 and a high scale indicates good HRQol.

Data Analysis

Mean, standard deviation (S.D.) and percentage were appropriately applied according to level of measurement of data. Paired *t*-test was used to test whether HRQoL score changes after surgery were significant. All analyses were done by using STATA version 8.0.

RESULTS AND DISCUSSION

Characteristics of Study Patients

Table 1 shows baseline characteristics of the study patients. Total of 112 patients were available for completing the questionnaires at 5-month follow-up, while 8 patients died after

Table 1. Characteristics of the study patients characterized by type of surgery

Variables	CABG n = 44	Valve n = 64	Congenital n = 14	Total n = 122	*p*-Value
Gender					
Male	36 (24.2)	28 (35.1)	3 (7.7)	67 (54.9)	< 0.001
Age (years) [mean (S.D.)]	60.4 (8.5)	46.9 (11.7)	34.4 (11.9)	50.3 (13.6)	< 0.001
Marital status					
Single	6 (11.8)	20 (17.2)	7 (21.9)	38 (17.0)	0.367
Married	43 (84.3)	85 (73.3)	21 (65.6)	167 (74.9)	
Devoted/separated	2 (3.9)	11 (9.5)	4 (12.5)	18 (8.1)	
Level of education					
Primary school	38 (86.4)	60 (93.7)	9 (64.3)	107 (87.7)	< 0.001
Secondary school	4 (9.1)	2 (3.1)	1 (7.1)	7 (5.7)	
Diploma	1 (2.3)	1 (1.6)	2 (14.3)	4 (3.3)	
Bachelor	1 (2.3)	1 (1.6)	2 (14.3)	4 (3.3)	
NYHA					
I	18 (45.0)	9 (15.3)	3 (23.1)	30 (26.8)	< 0.001
II	18 (45.0)	33 (55.9)	6 (46.2)	57 (50.9)	
III	3 (7.5)	15 (25.4)	3 (23.1)	21 (18.8)	
IV	1 (2.5)	2 (3.4)	1 (7.9)	4 (3.6)	
Comorbid disease					
Diabetes mellitus (DM)	18 (31.6)	4 (7.0)	0 (0)	22 (38.6)	< 0.001
Chronic obstructive pulmonary disease (COPD)	1(1.8)	4 (7.0)	0 (0)	5 (8.8)	0.441
Atrial fibrillation	2 (3.5)	26 (45.6)	2 (3.5)	30 (52.6)	< 0.001

Data are presented as percentages, except for age which is expressed as mean and S.D.
CABG = coronary artery bypass graft, valve = valve surgery, congenital = congenital surgery.
The differences were tested by using chi-square test, except age that the independent *t*-test is used instead.

the surgery; 1 patient was not in full consciousness due to stroke after surgery, and 1 patient was lost to follow-up for unknown reason.

There were 44, 64 and 14 patients who were undergone CABG, valve surgery and congenital surgery, respectively. The percentage of male was significantly different among different surgery procedures which showed a low percentage of male in congenital surgery group. Patients who were undergone CABG were significantly older than other groups, while patients who were undergone congenital surgery were significantly younger than the other groups. The percentage of patients who completed only primary school was lowest in the congenital surgery group. In term of severity of heart disease according to NYHA classification, CABG patients were significantly better than the other two groups, since approximately 90% of CABG patients were classified into class I and II, while approximately 70% of the two groups of patients were classified into class I and II. The percentage of patients who had preoperative atrial fibrillation was highest in the valve surgery group, and diabetes mellitus was highest in the CABG group.

HRQoL Changes after Surgery

As shown in Table 2, Figure 1 and Figure 2, all HRQoL scores improved at 3 and 5 months after surgery, as compared to the preoperative assessment. At 5-month follow-up assessment, physical health as measured by using DASI and 9-THAI physical health domain significantly increased from the baseline assessment. The 9-THAI mental health scores at 5 months significantly increased, while the CES-D scores at 5 months significantly decreased, and both indicated the improvement of mental health of patients after surgery. In term of cognitive function as measured by RAND, the significant improvement after surgery was indicated by the significant increment of RAND cognitive function scores. The significant improvement of HRQoL was also reflected by the disease specific measure, since the SAQ scores at 5 months significantly increased. In term of treatment satisfaction, scores at 3 and 5 months increased from baseline; however, the changes did not reach the statistical significant level. The overall HRQoL as measured by EQ5D VAS significantly improved at 3 and 5 months after surgery.

The battery questionnaires were used to measure the HRQoL of patients before, 3 and 5 months after open heart surgery at the Queen Sirikit Heart Center. The patients who were undergone open heart surgery reported markedly low health status on all dimensions at the preoperative period. At the post operative period, there was the significant improvement on physical function. The DASI and 9-THAI physical scores significant increased at 3 and 5 months after surgery. The DASI scores reported in this study were similar to previous studies.[19-21]

The mental health status measured by 9-THAI and CES-D significantly improved after the surgery, *i.e.* scores of 9-THAI mental health increased and scores of CES-D decreased. The CES-D scores at baseline of these patients were higher than the cut-point criterion (score of above 16), while the CES-D scores decreased to be lower than the cut-point criterion after the surgery. Results of CES-D scores found in this study were similar to that reported in previous studies.[12-14,21] The improvement on mental health of these patients could be explained by the reliefs of anxiety and depression after the success surgery.

The cognitive function significantly improved after the surgery. Patients in this study did not show the decline of cognitive function after the surgery as that reported in some previous studies.[5,22,23] Though the major cardiac surgery might probably increase the risk of cognitive decline in elderly patients, the precise pathophysiological mechanisms for post-operative cognitive decline are still unknown. In addition, the cognitive function declination in the previous studies was found in the period of beyond 4 months after the surgery. Thus patients in this study should be monitored of cognitive function in the long-term follow-up assessment in future studies.

Table 2. Quality of life measures of open heart surgery patients at baseline, 3 months and 5 months after surgery (n = 122)

HRQoL	Range	Baseline	3 Months	5 Months	Mean differences between baseline and 3 months	*p*-Value	Mean differences between baseline and 5 months	*p*-Value
DASI score	0-58.2	37.6 (16.5) n = 110	47.5 (12.9) n = 107	50.5 (11.8) n = 111	8.6 (14.6) n = 96	< 0.001	11.2 (14.4) n = 100	< 0.001
9-THAI physical score	-283.42-64.9	30.5 (19.3) n = 122	34.5 (21.7) n = 109	41.5 (15.1) n = 112	3.6 (22.4) n = 109	0.099	10.1 (19.9) n = 112	< 0.001
9-THAI mental score	-185.19 -62.02	36.2 (19.3) n = 122	38.1 (20.5) n = 109	42.8 (16.2) n = 112	0.3 (22.9) n = 109	0.877	4.9 (19.6) n = 112	0.009
CES-D	0-60	18.9 (8.5) n = 119	15.9 (7.7) n = 109	15.8 (8.6) n = 112	-2.3 (7.9) n = 106	0.003	-2.7 (7.6) n = 109	< 0.001
Cognitive function	0-100	79.8 (17.2) n = 120	84.1 (15.7) n = 109	86.4 (14.2) n = 112	3.6 (16.4) n = 107	0.026	6.0 (16.2) n = 110	0.002
Angina frequency*	0-100	42.5 (28.2) n = 43	94.7 (16.0) n = 40	95.9 (12.1) n = 42	50 (30.7) n = 38	< 0.001	52.5 (28.0) n = 40	< 0.001
Angina stability*	0-100	52.1 (35.8) n = 43	99.5 (3.2) n = 40	98.6 (6.8) n = 42	43.7 (34.4) n = 38	< 0.001	42.5 (35.7) n = 40	< 0.001
Treatment satisfaction*	0-100	88.4 (18.4) n = 43	95.0 (11.6) n = 40	94.0 (13.3) n = 42	6.6 (3.2) n = 38	0.048	5.6 (20.8) n = 40	0.095
EQ5D VAS	0-100	67.8 (23.8) n = 122	78.3 (18.1) n = 108	80.6 (18.3) n = 112	8.6 (25.2) n = 107	< 0.001	12.0 (24.2) n = 109	< 0.001

All scores are constructed as high scores indicating greater HRQoL, except for CES-D scores that high scores indicating greater depressive condition.
DASI = Duke Activity Status Index, 9-THAI = 9-item Thai Health Status Assessment Instrument, CES-D = Center of Epidemiological Study Depression Scale, EQ5D VAS = EuroQoL Visual analogue scale.

*Only CABG patients (n = 43) were assessed by using the Seattle Angina Questionnaires (SAQ).

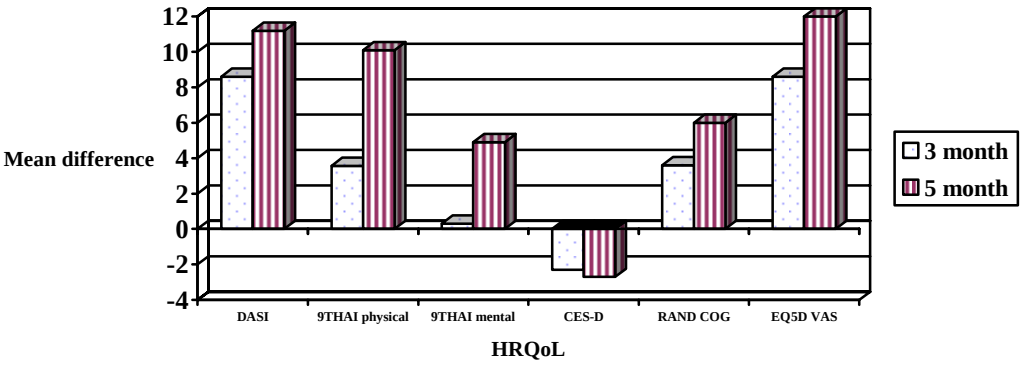

Figure 1. Mean differences of health related quality of life score at 3 and 5 months after surgery compared to baseline (n = 122).

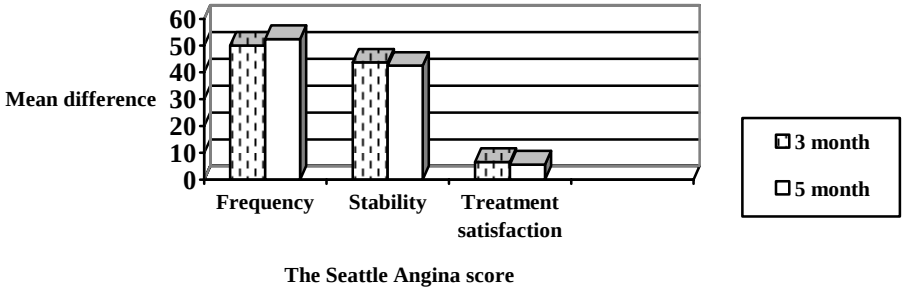

Figure 2. Mean differences of the Seattle Angina score at 3 and 5 months after surgery compared to baseline (n = 43).

The clinical data as measured by using SAQ also indicated the improvement of angina condition. It should be noted that since chest pain only occurs in CAD patients, then SAQ was considered to be relevant for assessing CABG patients.

The treatment satisfaction scores at 3 and 5 months after surgery non-significantly increased. The non-significant result of treatment satisfaction could be explained by the ceiling effect, since the treatment satisfaction scores at baseline assessment were high.

The significant improvement of overall HRQoL was also indicated by the EQ5D VAS score increment after surgery. The EQ5D VAS scores that were reported in this study were similar to previous studies.[4,24-26] It should be noted that the EQ5D VAS scores can be used to calculate the quality-adjusted life years (QALYs), and this thus enhances the applications of HRQoL to the cost-effectiveness analysis.

The new generic health status, 9-THAI, has been confirmed of its validity, and responsiveness in the sample of patients on renal replacement therapy (RRT).[13,14] The advantages of 9-THAI are its simplicity and the interpretation of two health domains scores across healthy Thai general population and several diseases. This study added the information of 9-THAI scores of open heart surgery. The scores of the study patients at baseline were lower than those of common diseases based on the general population survey. The 9-THAI physical and mental health scores of subjects with such morbidity as migraine, allergy, hypertension, diabetes mellitus, gastrointestinal (GI) or peptic

disorders were in ranges of 39.1-44.5 (physical) and 41.5-46.8 (mental).[14] When compared to the results of previous study, the average 9-THAI physical health score of the study patients at baseline assessment (30.5) was comparable to that of hemodialysis patients (30.1).[14] However, the average 9-THAI mental health score of the study patients at baseline assessment (36.2) was higher than that of the hemodialysis patients (28.9). The hemodialysis patients in the previous study were the patients who were on the waiting-list for kidney transplantation. The limited cadaveric kidney donors might explain the worse mental health condition of these patients when compared to the open heart surgery patients. At 5-month follow-up assessment, the average 9-THAI physical health score of open heart surgery patients (41.5) was comparable to that of hypertensive subjects (41.6). In addition, the average 9-THAI mental health score of the open heart surgery patients (42.8) was comparable to those of subjects with back pain, arthralgia or osteoporosis (42.9, 43.0), and it was a little bit lower than those of subjects with GI/peptic disorders or asthma (43.5, 43.8). The results of 9-THAI of open heart surgery patients that were reported in this study were added with the evidence of validity of this new generic measure, and this also suggested the validity of this new measure in this group of patients for future applications.

CONCLUSION

In summary, the patients who were undergone the success open heart surgery had the significant improvement in terms of physical health, mental health, cognitive function, clinical conditions, and overall HRQoL at 3- and 5-month follow-up after the surgery. This study added the evidence of the benefit of open heart surgery in term of subjective outcomes as HRQoL; however, the long term benefit based on the longer period of assessments would provide the useful information of HRQoL of these patients.

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