Self-Reported Physical Quality of Life Before Thoracic Operations Is Associated With Long-Term Survival

Mamdoh Al-Ameri, MD, Per Bergman, MD, PhD, Anders Franco-Cereceda, MD, PhD, and Ulrik Sartipy, MD, PhD

Department of Cardiothoracic Surgery and Anesthesiology, Karolinska University Hospital, Stockholm; and Department of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden

Background. **The aim was to analyze the association between baseline self-reported health-related quality of life and long-term survival after thoracic operations.**

Methods. **In a prospective population-based cohort study, we included patients scheduled for thoracic operations and obtained information about preoperative health-related quality of life using the validated quality-of-life instrument Short Form-36. Patients were categorized according to higher or lower physical and mental component scores, compared with an age- and sex-matched reference population. The primary outcome measure was all-cause mortality and was ascertained from Swedish national registers. We used Cox regression for estimation of hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between preoperative physical/mental quality of life and long-term survival while adjusting for differences in baseline characteristics, cancer stage, histopathologic process, and other factors.**

Results. **We included 249 patients between 2006 and 2008. During a median follow-up time of 8.0 years, 119 patients (48%) died. Having a physical component summary score less than reference was significantly associated with mortality (multivariable adjusted HR 2.02, 95% CI: 1.34 to 3.06, $p = 0.001$). A mental component summary score less than reference was not associated with mortality (adjusted HR 1.32, 95% CI: 0.84 to 3.06, $p = 0.233$).**

Conclusions. **In patients who underwent thoracic operations, a self-reported physical quality of life lower than reference value was associated with significantly worse survival independent of histopathologic process, cancer stage, extent of operations, and other patient-related factors. The preoperative mental component of quality of life was not associated with long-term survival.**

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The ability to accurately assess mortality risk is required of surgeons to inform and counsel patients facing major surgical procedures. Objective risk assessment is aided by risk prediction models and is commonly used in cardiology [1, 2] and cardiac surgery [3, 4]. Prediction models usually include a number of variables to estimate the risk that a specific outcome (eg, death) will happen within a defined time period in a patient with a particular risk profile (set of variables). The Thoracoscore is a generally accepted [5] risk prediction model for in-hospital death in thoracic operations [6] and has also been shown to predict midterm probability of death in patients undergoing general thoracic operations [7]. The utility of patient-reported outcome measures for risk prediction has gained increasing interest in recent years, and studies have shown that health-related quality of life was associated with survival in patients with cancer [8, 9], after coronary artery bypass grafting [10], and after lung cancer operations [11–13].

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Address correspondence to Dr Sartipy, Department of Cardiothoracic Surgery and Anesthesiology, Karolinska University Hospital, SE-171 76 Stockholm, Sweden; email: Ulrik.Sartipy@karolinska.se.

The aim of this study was to analyze the association between baseline self-reported health-related quality of life and long-term survival after thoracic operations.

Patients and Methods

The study was approved by the regional Human Research Ethics Committee, Stockholm, Sweden (Dnr: 2006/359-31/3 and 2015/2337-32).

Study Design

This was a prospective population-based cohort study.

Patients and Outcomes Measures

Patients who were scheduled for a thoracic operations at Karolinska University Hospital, Stockholm, Sweden, between 2006 and 2008 were included in the study and completed a preoperative Medical Outcome Study 36-Item Short Form questionnaire (SF-36). Karolinska University Hospital is the only referral center for thoracic operations in Stockholm County and serves approximately two million inhabitants or 20% of the total Swedish population. The primary outcome measure was all-cause mortality. Vital status was determined January

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31, 2016, by using the Swedish personal identity number [14] and the continuously updated Swedish population register [15].

Quality-of-Life Instrument

The SF-36 (Swedish version) is a self-administered questionnaire measuring health-related quality of life [16]. The SF-36 evaluates eight 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 scale range from 0 to 100, with higher scores indicating better health status. Overall physical and mental health-related quality of life can be assessed by the physical and mental component summary (PCS and MCS) scores, respectively. The SF-36 scores can be compared with reference scores from the general population.

Definitions

For the purpose of this study, patients were categorized as having higher or lower quality of life compared with a reference population. The PCS score for each patient was compared with the PCS score of an age- and sex-matched reference population. If the PCS score of the patient was lower than the score of the reference population, the patient was categorized into the "lower than reference" group, and otherwise the patient was categorized into the "higher than reference" group. The same approach was used for the MCS score. Ischemic heart disease was defined as a history of angina pectoris, myocardial infarction, or revascularization procedure (ie, coronary artery bypass operations or percutaneous coronary intervention). Hypertension was defined as a history of high blood pressure requiring medication. Congestive heart disease was defined as a history of heart failure or a left ventricular ejection fraction less than 0.5. Diabetes mellitus was defined as diabetes requiring insulin or oral antidiabetic medication. Peripheral vascular disease was defined as a history of claudication, carotid stenosis, or abdominal aneurysm. Cerebrovascular disease was defined as a history of stroke or transient ischemic attack. The extent of lung resection was divided into two groups: sublobar resection versus lobectomy/pneumonectomy. Tumor stage was divided into two groups: stage 0 to I and stage II to III. Smoking status was divided into three categories: current, former, and never smoker. Current smoker was defined as an active smoker or a person who had stopped smoking within 1 year of surgical procedure. Former smoker was defined as a previous smoker who had stopped smoking more than 1 year before surgical procedure. Never smoker was defined as a person who had never been an active smoker. Estimated glomerular filtration rate was calculated according to the Chronic Kidney Disease Epidemiology Collaboration formula [17].

Statistical Analyses

Baseline characteristics were described with frequencies and percentages for categorical variables and with mean and standard deviation for continuous variables. Person-time in days was counted from the date of operations until the date of death or the end of follow-up (January 31, 2016). The Kaplan-Meier method was used to calculate cumulative survival. We used Cox proportional hazards regression with and without multivariable adjustment to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between preoperative quality of life and long-term survival. The multivariable Cox model included the following variables: age (continuous), sex (male/female), cancer stage (0 to I/II to III), comorbidity (no/yes), estimated glomerular filtration rate (continuous), extent of operations (sublobar resection versus lobectomy/pneumonectomy), malignant histopathologic process (no/yes), adjuvant therapy (no/yes), hemoglobin (continuous), albumin (continuous), body mass index (continuous), forced expiratory volume in 1 second (continuous), and smoking history (never/former/current). In addition, the Cox model for the association between physical quality of life and survival included the baseline MCS score (continuous), and the Cox model for the association between mental quality of life and survival included the baseline PCS score (continuous). Data were missing for the following variables: smoking history (8%) and forced expiratory volume in 1 second (15%). Multiple imputation by chained equations was used to handle missing data [18]. Twenty-five data sets were imputed, and estimates from these data sets were combined. Statistical analyses were performed using Stata version 14.1 (StataCorp LP, College Station, TX).

Results

Patient Characteristics and Survival

We included 249 patients with a mean age of 63.8 years and 48% were women. Patient characteristics are shown in Table 1. A lower PCS score than an age- and sex-matched reference population was found in 43% of patients (108 of 249), and a lower MCS score than an age- and sex-matched reference population was found in 72% of patients (180 of 249). During a median follow-up time of 8.0 years, 48% of patients (119 of 249) died; 38% (54 of 141) of the patients with a higher PCS score, and 60% (65 of 108) of the patients with a lower PCS score compared with the reference population, respectively, and 38% (26 of 69) of the patients with a higher MCS score, and 52% (93 of 180) of the patients with a lower MCS score compared with the reference population, respectively.

SF-36 Scores

The SF-36 subscale and summary scores for the total population and the age- and sex-matched reference population are shown in Table 2. The mean PCS scores in patients with a lower and higher PCS score than the reference population were 35 and 53, respectively. The mean MCS scores in patients with a lower and higher MCS score than the reference population were 33 and 56, respectively.