

# The Likert scale is a powerful tool for quality of life assessment among patients after minimally invasive coronary surgery



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## Abstract

**Introduction:** Health-related quality of life (QoL) is an acknowledged index of treatment effectiveness. There are several methods of its evaluation which are predisposed to different risk of bias.

**Aim:** To investigate the agreement between objective and subjective tools of QoL assessment in patients who underwent endoscopic atraumatic coronary artery bypass (EACAB) grafting.

**Material and methods:** This prospective observational study covered 705 consecutive patients who underwent EACAB between April 1998 and December 2010. Quality of life was assessed in a follow-up of 2132 ±1313 days among 482 subjects using the WHOQoL-BREF questionnaire as an objective tool and the Likert scale as a more subjective method.

**Results:** There was good agreement between a 5-step Likert scale and a 5-step BREF Q1 ('overall quality of life') and Q2 ('general health') with a concordance correlation coefficient of CCC = 0.64 (95% CI: 0.58–0.69) and CCC = 0.49 (95% CI: 0.43–0.55), respectively. There was also a statistically significant correlation between answers reported using the Likert scale and all domains of BREF: physical health ( $R = 0.54, p < 0.001$ ), psychological health ( $R = 0.56, p < 0.001$ ), social relationships ( $R = 0.45, p < 0.001$ ) and environment ( $R = 0.56, p < 0.001$ ).

**Conclusions:** The Likert scale is useful in QoL assessment in patients after minimally invasive coronary surgery. This simple and easy-to-use screening method may be used interchangeably with a more reliable but also more complex questionnaire tool.

**Key words:** quality of life, WHOQoL-BREF questionnaire, Likert scale.

## Introduction

Health-related quality of life (HRQoL) is usually described as the influence of the disease and its treatment on

## Streszczenie

**Wstęp:** Ocena jakości życia (QoL) jest uznanym miernikiem efektywności terapii. Istnieją różnorodne metody analizy jakości życia uwarunkowanej aktualnym stanem zdrowia (HRQoL), które różnią się swoistością i czułością.

**Cel:** Porównanie obiektywnego i subiektywnego narzędzia oceny HRQoL u pacjentów, którzy przeszli endoskopowe atraumatyczne pomostowanie tętnic wieńcowych (EACAB).

**Materiał i metody:** Prospektywne badanie obserwacyjne obejmowało 705 kolejnych pacjentów, którzy przeszli EACAB od kwietnia 1998 do grudnia 2010 r. Jakość życia oceniono u 482 osób za pomocą kwestionariusza WHOQoL-BREF jako obiektywnego narzędzia i skali Likerta jako metody subiektywnej. Średni czas obserwacji wynosił 2132 ±1313 dni.

**Wyniki:** Stwierdzono zadowalającą zgodność między 5-stopniową skalą Likerta a 5-stopniowymi wskazaniami kwestionariusza BREF: Q1 (ogólna jakość życia) i Q2 (ogólny stan zdrowia): współczynniki zgodności wynosiły odpowiednio: CCC = 0,64 (95% CI: 0,58-0,69) i CCC = 0,49 (95% CI: 0,43-0,55). Wykazano znamiennej statystycznie korelację między odpowiedziami zgłaszanymi za pomocą skali Likerta a wszystkimi dziedzinami BREF: zdrowie fizyczne ( $R = 0,54, p < 0,001$ ), zdrowie psychiczne ( $R = 0,56, p < 0,001$ ), relacje społeczne ( $R = 0,45, p < 0,001$ ) i środowisko ( $R = 0,56, p < 0,001$ ).

**Wnioski:** Skala Likerta jest użyteczna w ocenie QoL u pacjentów po zabiegach małoinwazyjnego pomostowania tętnic wieńcowych. Ta prosta i łatwa w obsłudze metoda badań przesiewowych może być stosowana zamiennie z bardziej wiarygodnym, jednak złożonym narzędziem, jakim jest kwestionariusz WHOQoL-BREF.

**Słowa kluczowe:** jakość życia, kwestionariusz WHOQoL-BREF, skala Likerta.

the patient's social roles and a general feeling of satisfaction with life [1]. It is multifactorial and evaluates numerous aspects of everyday functioning of the patient.

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The methods applied for QoL assessment should acknowledge psychometric properties and should be adjusted to the specific population and the disease. Several more or less subjective scales and questionnaires are widely used for HRQoL assessment worldwide. Subjective scales are quick and easy to use. Unfortunately, their results are prone to bias. By contrast, the questionnaires are more complex but enable us to acquire more objective information.

Quality of life has been studied predominantly among coronary patients undergoing cardiac surgery via sternotomy or those having percutaneous interventions [2–5]. Still, little is known about QoL after minimally invasive coronary artery bypass grafting via lateral thoracotomy [6–8]. Moreover, there are no convincing data regarding reliability of the available methods of QoL assessment in this unique population.

### Aim

Therefore we aimed to investigate agreement between objective and subjective methods of QoL assessment among subjects who underwent endoscopic atraumatic coronary artery bypass grafting (EACAB).

### Material and methods

We studied 705 consecutive patients who underwent EACAB between April 1998 and December 2010 in a high-volume tertiary cardiac surgery center in Poland. A prospective study of QoL assessment was conducted from February to December 2011. The duration of the postoperative follow-up was  $2132 \pm 1313$  days (median: 1918 days). Time delay between the surgery and QoL assessment had no impact on the results of the Likert scale ( $p = 0.6$ ) or the summary result of the WHOQoL-BREF questionnaire ( $p = 0.1$ ) (Fig. 1). Twenty-three individuals died during this period and complete data were obtained from 68.4% of survivors.

Quality of life was assessed based on the information provided by patients by either telephone interview or letter correspondence. At the first stage, patients were asked to self-evaluate their current QoL by answering a question: ‘What is your current quality of life compared to the preoperative period?’ using a 5-step Likert scale [9]. The answers were reported as: considerable deterioration (level 1), deterioration (level 2), no change (level 3), improvement (level 4) or considerable improvement (level 5). At the second stage, subjects were asked to fill in a Polish version of the WHOQoL-BREF questionnaire [10]. The tool consists of 26 questions describing: (1) physical health, (2) psychological health, (3) social relationships and (4) environment. To provide a broad and comprehensive assessment, one item from each of the 24 facets from the WHOQoL-100 was included. In addition, two items from the ‘overall quality of life’ (Q1) and ‘general health’ (Q2) facet were used. A detailed description of the WHO tool can be found elsewhere [10].

The study was approved by a local ethics committee. All patients provided their informed consent.

### Statistical analysis

Statistical analysis was performed using MedCalc Statistical Software (MedCalc Software bvba, Ostend, Belgium). Quantitative variables are expressed as mean and standard deviation (those normally distributed) or median and interquartile range (IQR) (those non-normally distributed). The normality of distribution was verified using the Shapiro-Wilk test. Qualitative variables are expressed as crude values (percentage). Between-group differences for quantitative variables were assessed using the Mann-Whitney  $U$ -test. Pearson’s correlation coefficient ( $r$ ) or Spearman’s rank correlation coefficient ( $R$ ) was calculated for appropriate quantitative data. The concordance cor-

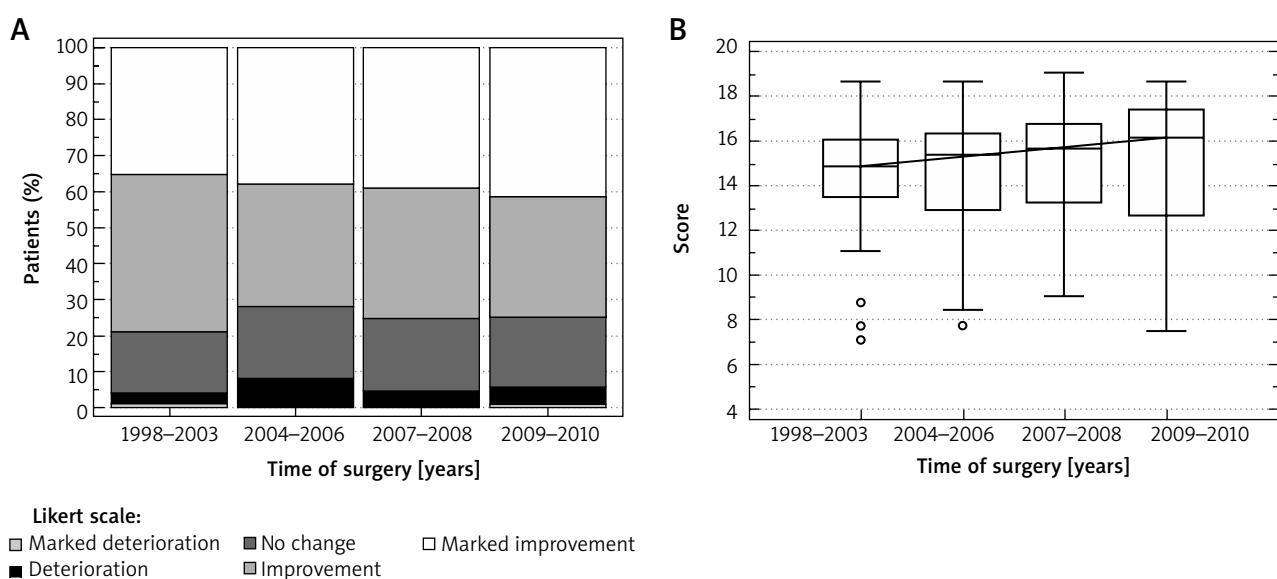
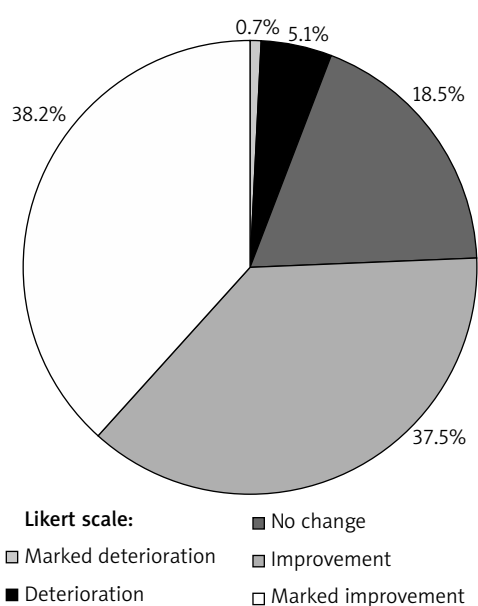


Fig. 1. Impact of time of surgery on quality of life: **A** – Likert scale, **B** – the total score of the questionnaire

**Table I.** Baseline characteristics of subjects undergoing QoL assessment

Variable	Value
Age [years]	58 ±9
Male gender (%)	81.1
Diabetes (%)	15.1
Body mass index ≥ 25 kg/m <sup>2</sup> (%)	67.9
Previous myocardial infarction (%)	38.4
Arterial hypertension (%)	44.7
Peripheral arterial disease (%)	1
Renal failure (%)	0.4
Obstructive pulmonary disease (%)	2.1
Left ventricle ejection fraction (%)	54 ±6



**Fig. 2.** Quality of life on Likert scale

relation coefficient (CCC) was used to evaluate between-method agreement. A *p*-value < 0.05 was considered significant.

**Results**

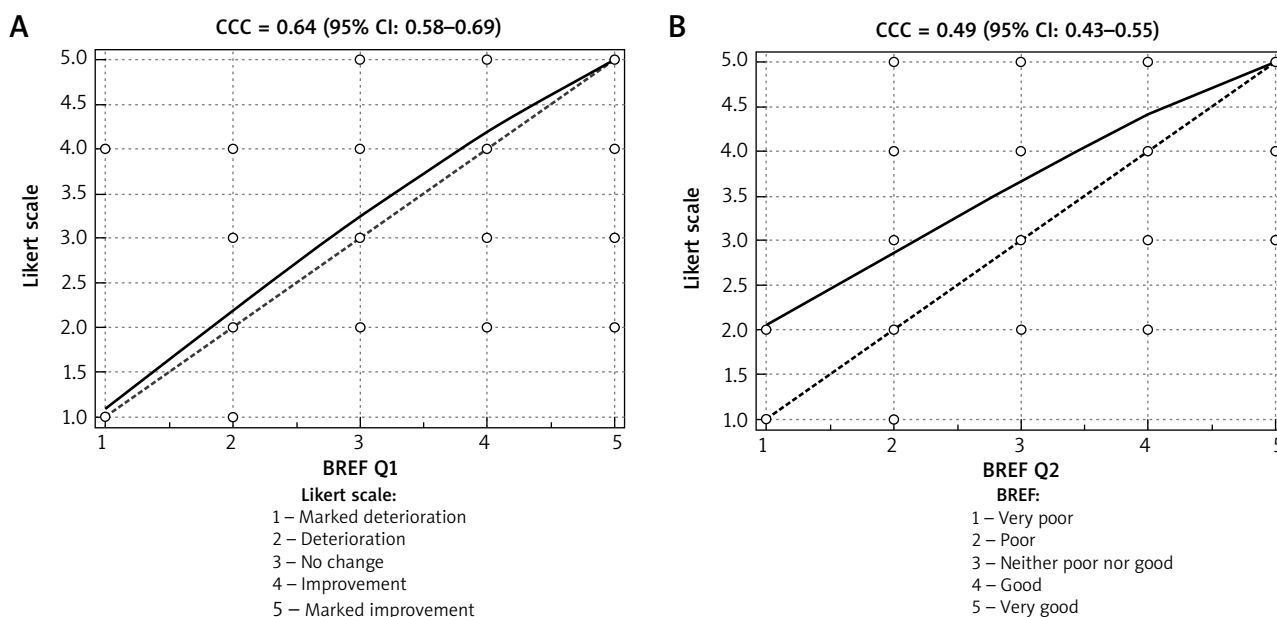
The study group consisted of 482 patients (391 men, 81%) aged 58 ±9 years. Their baseline characteristics are depicted in Table I.

Compared with the preoperative period, QoL improved in 75.7% of patients and only 5.8% of subjects reported its deterioration (Fig. 2). The overall result in the BREF was 15 ±3 points. The answers in Q1 and Q2 were as follows: 3.89 ±0.83 points and 3.59 ±0.79 points, respectively. In domain ‘5’ of the BREF the reported level of QoL was 15 ±3 points. For particular domains of the QoL the best results were obtained for psychological health (15.7 ±2.70 points) and social relationships (14.98 ±2.77 points) followed by the environment domain (14.67 ±2.46 points) and physical health (14.21 ±2.81 points).

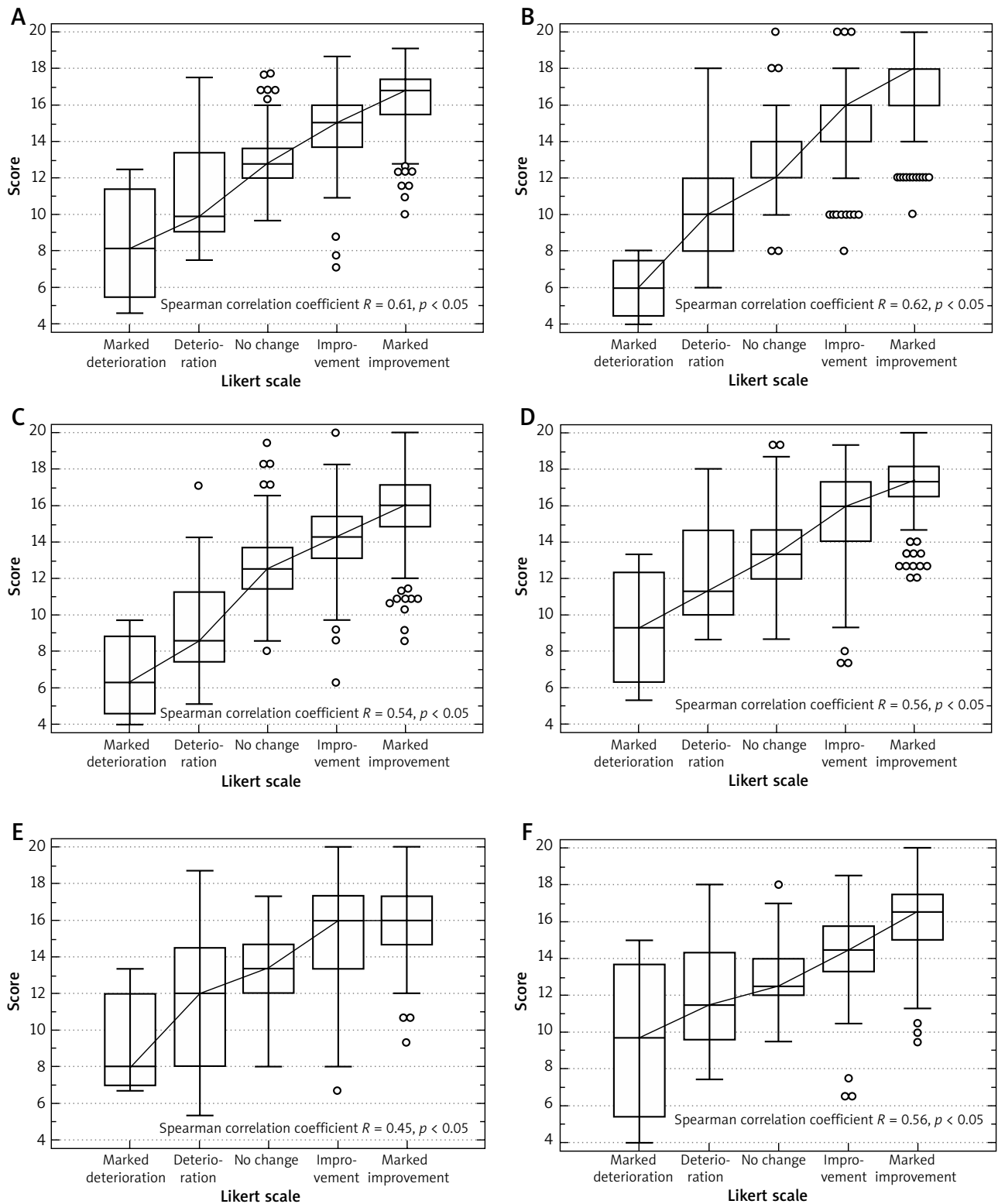
There was good agreement between the 5-step Likert scale and the 5-step Q1 (‘overall quality of life’) and Q2 (‘general health’) in BREF with a concordance correlation coefficient of CCC = 0.64 (95% CI: 0.58–0.69) and CCC = 0.49 (95% CI: 0.43–0.55), respectively (Fig. 3). There was also a statistically significant correlation (*R* = 0.45–0.62, *p* < 0.05) between answers on the Likert scale and all domains of QoL in BREF (Fig. 4).

**Discussion**

Reductions in angina symptoms and in the rate of major adverse cardiac and cerebrovascular events (MACCE) are major benefits achieved by patients after EACAB [11–14]. At the same time, QoL is an important parameter of treatment effectiveness [15]. Reliable and precise assessment of



**Fig. 3.** Agreement between Likert scale and BREF Q1 (‘overall quality of life’) (A) and Q2 (‘general health’) (B)



**Fig. 4.** BREF results by five levels of Likert scale: total score (A), self-assessment of QoL (B), physical health (C), psychological health (D), social relationships (E), environment (F)

QoL has become an important goal of clinical decisions for health practitioners. Among patients with ischemic heart disease it is not an easy task as it involves a whole spectrum of variables which are related to the chronicity of the disease process, its progression in time, possible exacerbations of symptoms and various external confounders.

While it is recognized that QoL is ultimately as important as quantity of life, efforts to implement quality of life measurement often fail due to definitional differences, where different investigators attribute different meaning to the term and, as a result, measure different endpoints; and due to insufficient information about available measures, it

leads to improper test selection and unnecessary regeneration of new items [16].

To our knowledge, our study is the first one confirming that simple assessment of QoL with a 5-step Likert scale may be almost as reliable as complex evaluation with the BREF questionnaire in coronary patients after surgical revascularization. The vast majority of published studies investigating QoL in coronary subjects relied on questionnaires. However, simple tools of subjective assessment have also been applied [17–19]. In the cardiac surgery setting, Markou and Noyez [17] concluded that the visual analogue scale (VAS) helps to identify patients with a good QoL. However, subjects scheduled for high-risk surgery and those with a better quality of life as the primary indication required more extended assessment. Safley *et al.* [18] successfully implemented in their study the EQ5D VAS to investigate quality of life benefits of percutaneous coronary intervention. Finally, in a prospective observation, Westin and colleagues [19] using a simple tool evaluated between-gender differences in QoL in patients after acute myocardial infarction, coronary artery bypass grafting and PCI.

Firstly, the study population was heterogeneous in terms of the time of observation, which was from several months to 12 years. As a result, QoL in patients shortly after the surgery was dependent on different issues (pain and immobility associated with surgery) than after a few years of follow-up (MACCE occurrence). However, our sub-analyses showed that follow-up duration had an insignificant effect on the answers. Secondly, the complete follow-up data were obtained from 70% of subjects. Despite this drawback, our study group is currently the largest published cohort of EACAB patients among whom QoL was reported. Thirdly, QoL was assessed only after the procedure and no pre-operative QoL data were available. Similar methodology was, however, used in the several previously published reports [15, 20, 21]. Finally, VAS was found to be less vulnerable to bias from confounding factors than the Likert scale [22]. Because the time needed to complete the VAS is shorter than that to complete the Likert-scale tool, the subjects are less disrupted and focus more on the issue being investigated. But it also means that more complex questionnaires are at higher risk of bias than a Likert scale. Additionally, administration of a Likert scale results in fewer missing values compared to other tools [23].

## Conclusions

The Likert scale is useful in QoL assessment in patients after minimally invasive coronary surgery. This simple and easy-to-use screening method may be used interchangeably with more reliable but also more complex questionnaire tools.

## Disclosure

Authors report no conflict of interest.

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