Assessment of Quality of Life in Chronic Obstructive Pulmonary Disease

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Abstract

In this study, we aimed to investigate the relationship between COPD severity, dyspnea degree and health-related quality of life that measures the disease effects on daily life and general well-being. In this prospective study, 251 patients with COPD as defined by ATS criteria were included. After physical examination, pulmonary function test, dyspnea staging done by visual analogue scale (VAS), and the St. George's Respiratory Questionnaire (SGRQ) for assessment of health-related quality of life measurement were applied to all patients. 86.85% of the patients were men and mean age was 65.55±8.82. There were 100 patients (39.8%) in stage 2, 131 patients (52.2%) in stage 3, and 20 patients (8.0%) in stage 4. Mean VAS was 63.6±13.7 mm. Mean SGRQ scores of subscales, namely, activity, symptom, impact, and total were 58.6±17.2, 57.2±13.9, 42.7±16.6, and 48.9±15.4, respectively. As the disease stage (severity) increased, a significant increase in SGRQ scores (symptom, activity, impact, and total scores) and VAS was observed ($p<0.05$). Positive correlation between VAS and SGRQ scores was observed ($p<0.05$). In the COPD stage-free assessment of SGRQ scores with age, there were high SGRQ scores in elderly patients ($p<0.05$). In conclusion, there was a correlation between quality of life, dyspnea degree and disease severity classified according to pulmonary function tests. As a result, health-related quality of life measurements may be an important indicator to determine the disease severity and dyspnea level.

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Introduction

Chronic obstructive pulmonary disease (COPD) is characterized by airflow limitation leading to reduced ventilatory capacity. The relationship between loss of lung function and dyspnea is not usually clear. COPD is one of the leading causes of morbidity and mortality in industrialized as well as in developing countries. The mortality rate for COPD is rising and COPD will probably become the third leading cause of death by the year 2020 (1). In COPD patients, the airflow limitation leads to reduced capacity for functional activities, decreased performance of daily activities, and ultimately an impairment in quality of life. More recently, the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines have identified the goals of treatment for patients with COPD. These include improved exercise tolerance and health related qu-

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ality of life and also important clinical goals such as prevention of disease progression and minimization of symptoms (2).

Although forced expiratory volume in one second (FEV_1) is important to obtain and essential in the staging of disease in any patient with COPD, other variables like degree of dyspnea (3), health-status scores (4) provide useful information that can improve the evaluation of patients with COPD. Each variable should correlate independently with the prognosis of COPD, should be easily measurable, and should serve as a surrogate for other potentially important variables.

Health-related quality of life has been defined as the functional effect of an illness and its consequent therapy upon a patient, as perceived by the patient (5). Health-related quality of life is an important domain for measuring the impact of chronic disease. Both general and disease-specific instruments have been used to measure health-related quality of life in patients with COPD.

Data pertaining to relationships between pulmonary function tests (PFT) and quality of life scores are somewhat variable. However, there is a consensus in the literature that the dyspnea level is associated with the general state of patients with COPD and many scales for assesssment of the dyspnea severity have been developed (6).

This study was carried out to investigate the effect of disease severity on quality of life in COPD patients and also the effect of age on quality of life in patients with stable and different stages of COPD.

Methods

Between December 2002 and October 2003, 251 patients with stable COPD were recruited in our outpatient respiratory clinic. The diagnosis of COPD was based on the definition provided by the American Thoracic Society (7). Entry criteria for the study were chronic airflow limitation, smoking history more than 20 pack-years, no history suggestive of asthma, no exacerbation of airflow limitation in the preceding six weeks, no changes in treatment regimen during the preceding four weeks, and quality of life questionnaire completion. Chronic airflow limitation was defined as a FEV_1/FVC ratio of less than 0.7 and FEV_1 of less than 80% of the predicted value. Age, smoking status, exacerbations in the last year, comorbidity, and physical examination findings were noted. Pulmonary function tests (PFT) were performed in all patients. Visual analogue scale (VAS) was used for dyspnea assessment and St. George's Respiratory Questionnaire (SGRQ) (8) for the assessment of quality of life.

Pulmonary function tests

Pulmonary function tests were performed using the Jaeger Master Screen Pneumo by the same person. Spirometric parameters, FEV_1, forced vital capacity (FVC), vital capacity (VC), FEV_1/FVC, and peak expiratory flow (PEF) were measured. Patients were classified according to GOLD as stage 1 (FEV_1>70%), stage 2 (70%>FEV_1>50%), stage 3 (50%>FEV_1>30%), and stage 4 (FEV_1<30%).

Dyspnea assessment

The visual analogue scale was used for assessment of dyspnea level. VAS consists of a line, 100 mm in length, placed horizontally on a page, with anchors to indicate extremes of a sensation. The anchors on the scale have not been standardized, but "not breathless at all" to "extremely breathless" and "no shortness of breath" to "shortness of breath as bad as can be" are frequently used. Scoring is accomplished by measuring the distance from the left side of the scale to the level indicated by the subject. Patients are asked to mark the line that is 100 mm according to feeling of dyspnea. 100 mm was defined as dyspnea always present (7).

Quality of life measurement

Quality of life was assessed using a Turkish translation of SGRQ, a 50-item disease-specific questionnaire that provides an overall measure for quality of life with subscale scores in three areas: symptom, activity, and impact of disease on daily life. To calculate the total and subscale scores, each item has a unique, empirically derived 'weight' from zero to 100 with a score of 100 indicating maximum disability.

Statistical analysis

The SPSS program (SPSS, 10 Inc, Chicago, IL, USA) was used to analyze the data. The arithmetic mean and standard deviation were calculated for all variables. For the analysis of COPD severity with other variables (gender, occupation, smoking status, treatment modality, exacerbations in the previous year, co-morbidity, and physical examination findings), Chi-Square and Oneway ANOVA tests were used. Post hoc comparisons Tukey test was used to analyze the correlation with COPD severity and dyspnea (VAS) and SGRQ scores (symptom, activity, impact, and total). Effect of age on quality of life (COPD severity-free) was investigated by regression analysis and comparison of quality of life and VAS was done by Pearson Correlation Test. $P<0.05$ was accepted as statistically significant.

Results

A total of 251 patients (218 male, 33 female) of a median age of 65.55±8.82 years (range 43-82 years) participated in the study. There were 100 patients (39.8%) in stage 2, 131 patients (52.2%) in stage 3, and 20 patients (8.0%) in stage 4. Mean duration of disease was 7.0±5.0 years. Smoking status was 53.4±33.2 pack-years. Mean VAS was 63.6±13.7 mm. Mean SGRQ scores of subscales, namely, activity, symptom, impact, and total were 58.6±17.2, 57.2±13.9, 42.7±16.6, and 48.9±15.4, respectively. Number of exacerbation was 0.8±0.9 per year.

Table 1. General parameters of COPD patients according to disease stage

Disease stage	Age (years)	Gender (M/F)	Duration of disease (years)	Smoking status (pack-years)	Number of exacerbations (per year)
Stage 2 (n:100)	65.3 ± 8.4 (88%-12%)	88/12	6.9 ± 4.8	48.8 ± 31.2	0.5 ± 0.8
Stage 3 (n:131)	66.1 ±9.2 (85%-15%)	112/19	7.0 ± 5.1	54.1 ± 33.6	0.9 ± 0.9
Stage 4 (n:20)	62.8 ±7.4 (90%-10%)	18/2	7.1 ± 5.1	71.2 ± 34.8	1.8 ± 1.1
Total (n:251)	65.0 ± 8.8 (87%-13%)	218/33	7.0 ± 5.0	53.4 ± 33.2	0.8 ± 0.9
p*	>0.05	>0.05	>0.05	**<0.05**	**<0.05**

*comparison done between disease stage groups

There was no significant difference between the COPD stages by age, gender, or duration of disease. According to smoking status, there was no difference between stage 2 and 3, but at stage 4 significant differences were observed ($p<0.05$) (Table 1). The number of exacerbations per year showed an increase with disease severity. In addition, current smoking caused an increase in SGRQ scores by increasing exacerbation frequency, although it did not directly cause quality of life deterioration.

Dyspnea scores, assessed by VAS increased by disease stage and were 54.6 mm in stage 2, 67.5 mm in stage 3 and 82.4 in stage 4 ($p<0.05$). All SGRQ scores (total, activity, symptom, and impact) were also significantly different in stage 2, 3, and 4 ($p<0.05$); activity scores were 47.41 in stage 2, 64.19 in stage 3, and 78.35 in stage 4; symptom scores were 42.70 in stage 2, 56.54 in stage 3, and 78.35 in stage 4; impact scores were 32.14 in stage 2, 47.41 in stage 3, and 64.83 in stage 4; total scores were 38.24 in stage 2, 53.90 in stage 3, and 69.96 in stage 4. A positive correlation between VAS and SGRQ scores was observed ($p<0.05$). This means that as SGRQ scores increased (Figure 1), VAS also increased (Figure 2).

Also, a disease stage-free effect of age on quality of life was found. The SGRQ scores increased with advanced age ($p<0.05$).

Discussion

COPD is a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases (2). The measurement of FEV_1 is essential for the diagnosis and quantification of the respiratory impairment resulting from COPD (2). In addition, the rate of decline in FEV_1 is a good marker of disease progression and mortality (9). However, FEV_1 does not adequately reflect all the systemic manifestations of the disease. Primary aims in treatment of COPD are to decrease the rate of disease progression and of exacerbations, to ameliorate the symptoms, to improve the performance of physical activities and also to improve the quality of life. For this reason, the use of health-related quality of life measures in COPD has currently achieved widespread acceptance. Besides that, although there are many tests that measure the pulmonary functions and changes in exercise capacity, these tests are difficult to apply and their cost-effectiveness is low. For these reasons, new tests containing more parameters about health status and which are easy to apply are needed.

Quality of life can be measured in patients with COPD either by disease-specific tools that have been specifically designed for use in patients with respiratory system disorders or by general quality of life tools that can be used across populations with a variety of medical conditions. Examples of disease-specific health-related quality of life tools for COPD are the St. George's Respiratory Questionnaire (SGRQ) (8), Chronic Respiratory Questionnaire (CRQ) (10), the Pulmonary Functional Status and Dyspnea Questionnaire (PFSDQ) (11), and Pulmonary Function Status Scale (PFSS) (12). General health-related quality of life instruments that have been used in patients with COPD include the Quality of Well-Being (QWB) (13), Sickness Impact Profile (SIP) (14), Nottingham Health Profile (NHP), and Health Status Index (SF-36) (15). The major advantage of using a disease-specific tool to assess the impact of pulmonary rehabilitation is that these measures address specific issues, such as shortness of breath, which have relevance to the patient's primary respiratory disease. However, with a generic quality of life measure, more global issues related to quality of life can be assessed, such as social role, mental health, and general well-being. Also, a new system called the BODE index for use in predicting the risk of death from any cause and respiratory causes among patients with COPD has been reported (16). This system includes body mass index (B), degree of airflow obstruction (O), dyspnea (D), and exercise capacity (E).

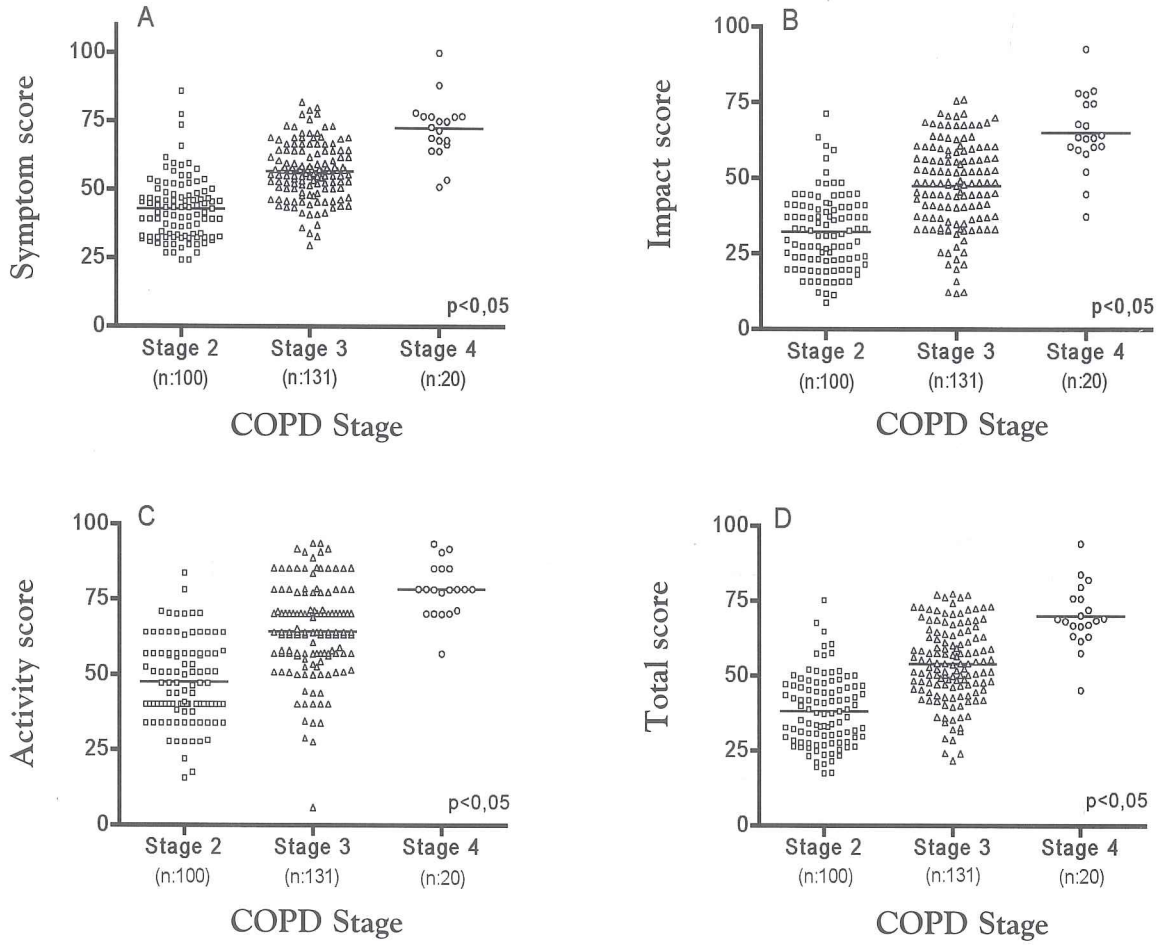

Figure 1. *Comparison of (A) symptom, (B) impact, (C) activity, (D) total scores of SGRQ in COPD stages.*

The original SGRQ was developed in 1990 by Jones to quantify the impact of disease on the health and well-being of patients with COPD (8). SGRQ is a self-administered health-related quality of life measure containing 50 items and divided into three components: symptoms, activity, and impact. The symptom component contains items concerned with the level of symptom severity including frequency of cough, sputum production, wheezing, breathlessness and the duration and frequency of breathlessness or wheeze. The activity component is concerned with physical activities that either cause or are limited by breathlessness. The impact component covers such factors as employment, being in control of health, panic, stigmatization, expectations for health, and disturbance of daily life. Scores ranging from zero to 100 are calculated for each component, as well as a total score which summarizes the responses to all items. Since 1990, the SGRQ has been translated into many languages and has been validated for use in different ethnic groups (17-20). The original SGRQ has also been validated for use in airway diseases such as asthma (21), COPD (19,20,22), and bronchiectasis (23).

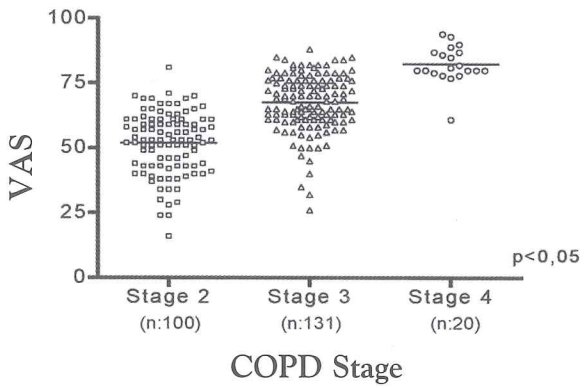

Figure 2. *Comparison of VAS results in COPD stages.*

Correlation between the decrease in FEV_1 and the deterioration of quality of life has been reported in COPD patients. In a study that investigated the effect of disease severity on quality of life measured by SGRQ, a relationship between FEV_1

and quality of life was found (18). Similarly, Prigatano et al showed that as the disease severity increased, quality of life decreased (24). Demir indicated that dyspnea and quality of life were useful in the evaluation of disease impact in COPD patients (25). In our study, impairment of quality of life was seen in all the patients participating in the study. As the disease stage progressed, SGRQ scores also increased ($p<0.05$). The activity score was deteriorated more than other SGRQ scores, and symptom and impact scores followed activity score, respectively. In addition, there was a relation between COPD exacerbations and disease severity. COPD exacerbations also caused an increase in SGRQ scores ($p<0.05$). There was no relation between quality of life and gender nor between quality of life and comorbidity.

Dyspnea is the most deletorious and most frequently stated symptom in COPD patients (7). This symptom is chronic, progressive, increasing in severity with disease progression. The assessment of dyspnea severity can be performed by many scales such as the Medical Research Council (MRC) Baseline Dyspnea Index (BDI) and the Transition Dyspnea Index (TDI). The Borg Scale and VAS can also be used for the dyspnea assessment (7). A correlation between both MRC BDI index and FEV_1 values was reported (20). Comert showed that increase in Borg dyspnea scale was related with deterioration SGRQ scores (26). In our study, VAS was used for the assessment of dyspnea severity and as the disease severity increased, a significant increase in VAS values was observed. The positive correlation between VAS and SGRQ scores shows that dyspnea is an important parameter which influences the quality of life in patients with COPD.

Smoking is the important risk factor in COPD development and pack year and duration are directly related with the development of the disease. There was a report that showed lower quality of life scores in younger and current smoker patients with high FEV_1 values than ex-smoker patients with COPD (24). There was an evident relation between the amount of smoking and disease severity ($p<0.05$). The disease severity was influenced by smoking status but current smoking affected the quality of life by causing COPD exacerbations although it did not directly cause quality of life deterioration.

Relationship between age and quality of life has not been shown although a decrease in quality of life with advanced age is expected. Ketelaars et al found no correlation between age and quality of life and explained this with aged patient expectation that activity limitation is normal in advanced age (27). Moreover, an improved quality of life in old patients with COPD and asthma was shown and it was related to the tolerance of aged patients to activity limitation (28). On the other hand, in a study done with 247 COPD patients, a positive correlation between disease severity and quality of life was found in patients over 65 years of age, but this correlation was not evident below this age (29). Peruzza et al reported that elderly COPD patients show a substantial impairment in SGRQ depending on the severity of airway obstruction; and that symptoms related to the disease may be exaggerated by mood deflection (30). In our study, the COPD stage free assessment of SGRQ scores with age showed high SGRQ scores, especially in activity score, in elderly patients, but this relation was not as evident as assessment of SGRQ by disease severity (p for disease severity<0.000, p for age<0.025).

The recent usage of health-related quality of life questionnaires have led to improvement in assessment of disease impact in patients with COPD. Assessment of patients both with physiological and quality of life parameters is desirable. The health-related quality of life instruments, possibly in combination with a scale to measure specific symptoms such as dyspnea and with pulmonary function tests, can be used to examine health-related quality of life in patients with COPD. In conclusion, in this study, a correlation between quality of life and dyspnea degree and disease severity was observed. These results indicate that health-related quality of life measurements may be used as an indicator of disease severity and dyspnea level in COPD patients.

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