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RESEARCH

A COMPARISON OF ACTIVITIES OF DAILY LIVING IN GERIATRIC AND NON-GERIATRIC PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

ABSTRACT

Introduction: Multiple disease entities in geriatric patients may exacerbate chronic obstructive pulmonary disease symptoms and lead to functional limitations. The purpose of this study was to assess and compare activities of daily living in geriatric and non-geriatric patients with chronic obstructive pulmonary disease.

Materials and Method: Thirty-eight patients with chronic obstructive pulmonary disease were included in this study. The patients were divided into two groups: geriatric (age>65 years) and non-geriatric (age<65 years). Dyspnea level was evaluated using modified Medical Research Council Dyspnea Scale. Activities of daily living were assessed with two performance-based activities of daily living tests: the Glittre Activities of Daily Living Test and the Activities of Daily Living Simulation Test.

Results: Pulmonary function and dyspnea levels of geriatric and non-geriatric patients were similar in the study (p>0.05). Glittre Activities of Daily Living Test time was significantly shorter in the non-geriatric patients than in the geriatric patients (p<0.05). Significantly fewer cycles in the Activities of Daily Living Simulation Test were completed by the geriatric patients than by the non-geriatric patients (p<0.05).

Conclusion: Activities of daily living performance is reduced in the geriatric patients with moderate to severe chronic obstructive pulmonary disease compared with younger individuals with same disease severity, dyspnea levels and comorbidities. Influences in activities of daily living of the geriatric patients with chronic obstructive pulmonary disease can be revealed as distinctive compared with the adult patients using these activities of daily living tests.

Key Words: Comorbidity; Pulmonary Disease, Chronic Obstructive; Activities of Daily Living; Dyspnea

ARAŞTIRMA

GERİATRİK VE GERİATRİK OLMAYAN KRONİK OBSTRÜKTİF AKCİĞER HASTALARINDA GÜNLÜK YAŞAM AKTİVİTELERİNİN KARŞILAŞTIRILMASI

ÖZ

Giriş: Geriatrik hastalarda birçok başka hastalıkların varlığı, kronik obstrüktif akciğer hastalığı semptomlarını kötüleştirebilmekte ve fonksiyonel limitasyonlara yol açabilmektedir. Bu çalışmanın amacı; geriatrik ve geriatrik olmayan kronik obstrüktif akciğer hastalarında günlük yaşam aktivitelerinin değerlendirilmesi ve karşılaştırılmasıydı.

Gereç ve Yöntem: Çalışmaya otuz sekiz kronik obstrüktif akciğer hastası dahil edildi. Hastalar; geriatrik (>65 yaş) ve geriatrik olmayan (<65 yaş) hastalar olarak iki gruba bölündü. Dispne seviyesi modifiye Medical Research Council Dispne Skalası ile değerlendirildi. Günlük yaşam aktiviteleri; performansa dayalı iki günlük yaşam aktiviteleri testi (Glittre Günlük Yaşam Aktiviteleri Testi ve Günlük Yaşam Aktiviteleri Simülasyon Testi) ile değerlendirildi.

Bulgular: Çalışmada, geriatrik ve geriatrik olmayan hastaların pulmoner fonksiyon ve dispne seviyeleri benzerdi (p>0,05). Geriatrik olmayan hastaların Glittre Günlük Yaşam Aktiviteleri Testi süresi, geriatrik hastalarınkinden anlamlı olarak daha kısaydı (p<0,05). Geriatrik hastaların Günlük Yaşam Aktiviteleri Simülasyon Testinde tamamladıkları tur sayısı, geriatrik olmayan hastalarınkinden anlamlı olarak daha azdı (p< 0,05).

Sonuç: Orta şiddetli-şiddetli geriatrik kronik obstrüktif akciğer hastalarında günlük yaşam aktiviteleri performansı; benzer hastalık şiddeti, dispne seviyeleri ve komorbiditeleri olan daha geç kişilerle karşılaştırıldığında azalmaktadır. Geriatrik kronik obstrüktif akciğer hastalarının günlük yaşam aktivitelerindeki etkilenimler, bu günlük yaşam aktiviteleri testleriyle yetişkin hastalara göre ayırıcı bir şekilde gösterilebilir.

Anahtar Sözcükler: Komorbidite; Kronik Obstrüktif Akciğer Hastalığı; Günlük Yaşam Aktiviteleri; Dispne.

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most common and growing health problem in patients over the age of 65 years (1,2). Several other disease entities in geriatric patients, including heart failure, anxiety, medication effects as well as other conditions, including chronic comorbidities such as deconditioning and malnutrition, may exacerbate COPD symptoms and lead to functional limitations (2,3). Both ageing and COPD contribute to an increased risk of physical and cognitive impairments, which, in turn, are risk factors for the development of functional disability, or to the inability to complete tasks associated with daily living (2).

Patients with COPD experience progressive dyspnea and exercise intolerance, which limit their ability to carry out activities of daily living (ADL). The difficulty of performing these activities is present during both basic and instrumental ADL. As a result, people with COPD often avoid such activities or compensate by receiving assistance from another person or using assistive devices (4). This in turn contributes to reduced independence and health-related quality of life (3,4). Despite its importance, current international professional guidelines on COPD neither include measurement of ADL as a recommended outcome nor provide any information on how best to measure ADL in a clinical or research setting (4).

Because activity limitations increase with age, we wanted to investigate ADL performance of geriatric patients with COPD compared with non-geriatric patients with COPD at the same obstruction level. The primary aim of this study was to determine the impact of COPD on ADL in geriatric patients compared with non-geriatric individuals using two disease-specific ADL performance tests. The secondary objective was to explore the practical utility of these tests for evaluating ADL and to show the discriminative properties of these ADL test methods for the geriatric population with COPD. We hypothesise that geriatric patients with COPD compared with non-geriatric patients with COPD could (1) perform worse in ADL tests, and (2) experience higher dyspnea and fatigue symptoms in ADL tests. These ADL tests were hypothesised to be practical for evaluating geriatric populations.

Materials and Method

Thirty-eight stable patients with COPD, aged 40–80, who were rated at stage II-III according to the standards of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) and who were experiencing dyspnea and arm fatigue in at least one ADL (mean FEV_1, 49.4±15.5%) participated in this study. Patients with musculoskeletal and neurological diseases that can affect exercise performance, symptomatic heart disease, history of lung surgery or cancer and/or inability to cooperate as required for the measurements and assessments used in the study were excluded. The study was approved by the Ethics Committee of Hacettepe University, and the patients signed an informed consent form prior to participating in it.

The physical and socio-demographic characteristics of all the subjects were recorded. Dyspnea levels of subjects were evaluated using the Modified Medical Research Council (MMRC) Dyspnea Scale (5).

The Charlson Comorbidity Index (CCI) was used for identification and grading of comorbidities. According to this index, a comorbid disease was scored according to its extent and severity. A weighted score was calculated by summing scores of the number of the patient's comorbid diseases (6).

The pulmonary function test (PFT) was performed with a Spirolab III spirometer (Spirolab, Medical International Research, Rome, Italy) according to American Thoracic Society/European Respiratory Society criteria. The PFT results were expressed as percentages of the expected values adjusted for age, height, body weight and sex (7).

ADL was evaluated using the Glittre ADL Test and the ADL Simulation Test. The activities in the Glittre ADL Test were selected to represent common ADL that are challenging for the patients with COPD. During the test, the patients carry a backpack, which holds 2.5 kg of added weight for women and 5.0 kg for men. The timed test started with the patient rising from a seated position. Then, the patient walked 10 m, walked up and down a two-step ladder placed in the middle between the chair and a set of three shelves on a free-standing bookcase. When the patient approached the shelves, they reached towards two shelves whose heights were adjusted based on the patient's shoulder and waist height. Three 1 kg weights placed on the top shelf were moved by the patient separately, first to the middle shelf, down to the bottom shelf, back to the middle shelf and finally to the top shelf again. The patient then turned, walked back to the chair in the same way, sat down, and immediately began another lap of the same task. The test consisted of five laps, and the patients were asked to complete them as quickly as possible. They were allowed to rest if necessary but were asked to start the activity again as soon as they could. Heart rate (HR) and oxygen saturation (SpO_2) values were obtained using a portable pulse oxi-

meter; arm fatigue, leg fatigue, general fatigue, and dyspnea perception scores were recorded using the modified Borg scale before and after the test. The total elapsed time to complete the test was also recorded (8,9).

In order to evaluate the patient's ability to exhibit ADL involving the upper extremities and to objectively assess their dyspnea level during these activities, the ADL Simulation Test was conducted according to test rules used by Ries et al. (10) and Costi et al. (11). The patients repeated the cycle of four simulated activities requiring the use of arms above shoulder height without any support as quickly as possible for 10 min. If necessary, the patient was allowed to stop and rest during the test and was instructed to restart the activity as soon as possible. Respiratory frequency (RF), HR and SpO_2 values, arm fatigue, general fatigue and dyspnea perception scores using the modified Borg scale were recorded before and after the test. The total number of cycles completed in 10 min was also recorded. Activities include: (1) erasing a fully drawn blackboard; (2) installing and removing three lamps in sockets on a board placed horizontally above the patient's head; (3) washing 10 dishes completely and putting them on a shelf above shoulder level; and (4) putting three packages, each weighing 1000 g, on a shelf above shoulder level.

Statistical Analysis

The statistical evaluation was performed using the SPSS 18.0 statistical package software for Windows (12). Variables were descriptively expressed as mean ± standard deviation, frequency and percentage. Normal distribution was evaluated using the Shapiro-Wilk test and histograms. The patients were divided into two groups: geriatric (age≥65 years) and non-geriatric (age<65 years) (13). Depending on test conditions, the continuous variables were compared using the Student's t test or the Mann Whitney-U test; the counted variables were compared by the Chi-Square test or the Fisher test. The level of significance was set to $p<0.05$ (14). Graphs were generated using the Windows-based Graphpad Prism 5.04 (Graphpad Software Inc., California, ABD) program.

Results

Physical and demographic characteristics of the geriatric and non-geriatric patients were similar in the study ($p>0.05$) (Table 1). No statistically significant difference in parameters of PFT and MMRC dyspnea levels were recorded ($p>0.05$) (Table 1). The CCI scores of the patients were also comparable ($p>0.05$ (Table 1). In addition, in the geriatric group, 40% of the patients had a CCI of 1 and 60% had a CCI

Table 1— Characteristics of Geriatric and Non-Geriatric Patients with COPD

Characteristics	Geriatric Patients (n=15)	Non-Geriatric Patients (n=23)	p
Age (years)	68.6±4.3	53.0±7.0	0.000*
Sex (male/female)	11/4	15/8	0.728
Height (cm)	165.3±8.1	165.8±7.8	0.845
Body weight (kg)	74.7±9.9	73.9±12.1	0.846
BMI (kg/m2)	27.4±3.4	27.0±5.0	0.810
FVC (%)	67.7±16.3	62.4±15.5	0.325
FEV_1 (%)	50.2±14.5	48.9±16.4	0.806
FEV_1/FVC (%)	61.1±15.1	64.8±17.4	0.509
$FEF_{25-75\%}$ (%)	26.9±10.5	32.6±21.9	0.745
PEF (%)	49.7±17.3	54.2±21.3	0.498
Smoking history (pack-years)	-45.8±36.6	28.8±24.0	0.145
MMRC (0-4)	1.9±0.8	1.7±0.8	0.371
GOLD stage (II/III)	6/9	12/11	0.463
Charlson comorbidity index score	2.0±1.0	1.7±1.0	0.293

*Student's t-test, $p<0.05$.

BMI: body mass index; FVC: forced vital capacity; FEV_1: forced expiratory volume in one second; $FEF_{25-75\%}$: forced expiratory flow 25–75%; PEF: peak expiratory flow; MMRC: Modified Medical Research Council dyspnea scale.

of ≥2. In the non-geriatric group, 56.5% of patients had a CCI of 1 and 43.5% had a CCI of ≥2.

Completing the Glittre ADL Test took significantly less time in the non-geriatric patients than in the geriatric patients ($p<0.05$) (Table 2, Figure 1). The Glittre ADL Test results also showed a statistically significant difference in arm fatigue perception between the two groups ($p<0.05$) (Table 2). No significant differences were noted in the two groups in change in HR, SpO_2, dyspnea, leg fatigue and general fatigue perception recorded during the test ($p>0.05$) (Table 2).

The geriatric patients completed significantly fewer cycles than the non-geriatric patients in the ADL Simulation Test ($p<0.05$) (Table 2, Figure 2). No statistically significant differences in the two groups were noted in change in HR, SpO_2, RF, dyspnea, arm and general fatigue perception recorded during the test ($p>0.05$) (Table 2).

Discussion

The main finding of this study is that ADL performance was reduced in the group of geriatric patients with moderate to severe COPD compared with the non-geriatric patients with the same disease severity, dyspnea levels and comorbidities. The study showed that the Glittre ADL Test and the ADL Simulation Test, which are two performance-based ADL tests, can be clinically used for obtaining information about the patient's ability to perform activities with lower extremities and unsupported upper extremities. In addition, these tests were less time-consuming for the clinician to administer than other tests. Influences on ADL of geriatric patients compared with non-geriatric patients can also be differentially identified from these ADL tests.

In their systematic review, Janaudis-Ferreira et al. (4) showed that majority of the instruments ADL assessment were self-reported; only three instruments were performance-based. The 6 min walk test (6MWT) may better reflect the functional exercise capacity for daily physical activities than other measures because most ADL are performed at a submaximal level (3). Although it does reflect limitations in ADL performance, the 6MWT does not evaluate the influence on ADL limitation of upper-limb work or on lower-limb activities other than walking (9,15). The Glittre ADL Test, one of the performance-based instruments cited, was specifically developed for patients with COPD (4,8,9). It yields information

Table 2— Activities of Daily Living Geriatric and Non-Geriatric Patients with COPD

	Geriatric Patients (n=15)	Non-Geriatric Patients (n=23)	p
Glittre ADL-test			
Test time (min)	3.4±1.4	2.7±0.9	0.005*
ΔHR (beats/min)	26.2±15.7	33.9±13.8	0.119
ΔSpO_2 (%)	-5.3±5.7	-5.0±5.8	0.731
Modified Borg-dyspnea perception (0-10)	3.5±2.3	3.6±2.3	0.988
Modified Borg-arm fatigue (0-10)	0.6±1.3	1.6±1.6	0.049*
Modified Borg-leg fatigue (0-10)	1.3±1.5	2.4±2.8	0.322
Modified Borg-general fatigue (0-10)	1.6±1.5	2.3±2.1	0.314
ADL-simulation test			
The cycles completed (n)	5.4±1.1	6.3±1.3	0.025*
ΔHR (beats/min)	13.2±7.0	12.0±8.0	0.639
ΔSpO_2 (%)	-0.8±2.7	-1.1±2.6	0.693
ΔRF (breaths/min)	3.8±4.9	3.8±5.8	0.959
Modified Borg-dyspnea perception (0-10)	1.4±1.2	1.5±1.8	0.841
Modified Borg-arm fatigue (0-10)	1.6±1.7	1.6±2.1	0.854
Modified Borg-general fatigue (0-10)	1.0±1.1	0.3±1.3	0.112

*Mann Whitney U-test, $p<0.05$.
HR: heart rate; SpO_2: oxygen saturation; RF: respiratory frequency.

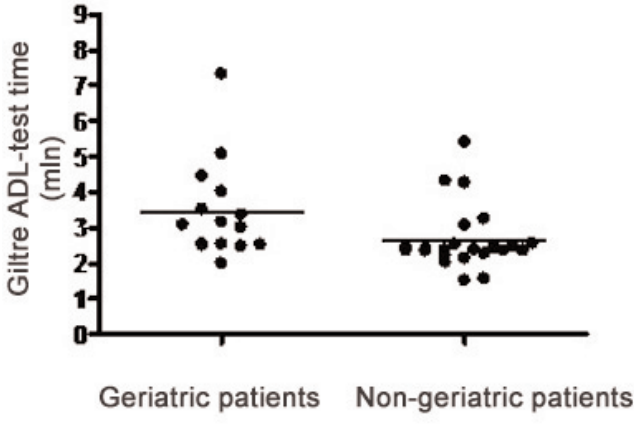

Figure 1— The difference in the Glittre ADL Test time between the geriatric and non-geriatric patients with COPD.

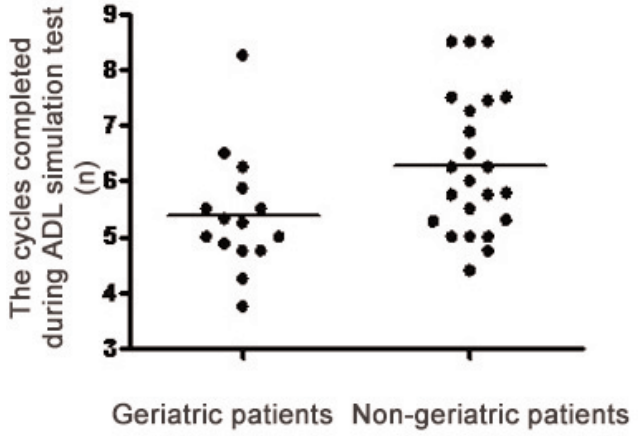

Figure 2— The difference in the cycles completed during the ADL Simulation Test between the geriatric and non-geriatric patients with COPD.

complementary to 6MWD for functional status assessment (9). It is shown in literature that the Glittre ADL Test can differentiate the functional capacity of COPD patients from that of healthy subjects (16). Our study also showed that the Glittre ADL Test can be used safely and practically in a geriatric population for gathering information about ADL performance and factors limiting ADL performance that are useful in developing a treatment plan.

Lahaije et al. (17) showed in their study that resting as well as ADL-induced dynamic hyperinflation (DH) independently contribute to decreased daily physical activity, together explaining 45.8% of the variance in physical activity independent of the degree of airflow limitation. Although increases in dyspnea, leg and general fatigue perception were comparable between the two groups in our study, sitting and rising from a chair, walking, climbing up and down stairs, bending and performing activities with unsupported arms could induce DH. We think that the greater increase in arm fatigue perception of the non-geriatric group is caused by the significantly quicker completion of the test than in the geriatric group. A study of 1288 elderly people confirmed that the level of physical activity decreases as a function of the ageing process, which in turn decreases functional fitness in both men and women (18). Older COPD patients have a high prevalence of fall-related risk factors, including gait and balance impairments, muscle weakness and nutritional deficits (2). In addition to ADL-induced DH, muscle weakness, gait and balance impairments occurring with age in the geriatric group may cause them to take a long time to finish the Glittre ADL Test. Although studies about the Glittre ADL Test conducted on COPD patients with similar average age and those that compare COPD patients with healthy subjects were found in literature, our study showed the activity limitations of the geriatric COPD patients were greater than those found in the non-geriatric COPD patients with same obstruction level.

Patients with COPD frequently experience marked dyspnea and fatigue during the performance of arm tasks important in daily life. Velloso et al. (19) reported that during ADL such as sweeping, erasing a blackboard, lifting pots and replacing light bulbs, metabolic and ventilatory parameters found in individuals with COPD increases, and patients with COPD demonstrate a significant increase in oxygen consumption (VO_2) (mean, 50.2% of maximum VO_2) and in minute ventilation (mean, 55.7% of maximum voluntary ventilation) compared with initial resting conditions for all four of these activities. Accompanying reductions in ventilatory and inspiratory reserve volumes highlight the contribution of ventilatory constraints on functional limitation in persons with COPD (19-21).

In their study, Vaes et al (22) measured task-related oxygen uptake in 97 elderly patients with COPD and 20 healthy

peers in five self-paced domestic ADL: putting on socks, shoes and vest; folding eight towels; putting away groceries; washing four dishes, cups and saucers and sweeping the floor for four minutes. The patients with COPD experienced a relatively high metabolic load and symptom perception during the performance of ADL, particularly in patients with a severe degree of airflow obstruction (GOLD stage IV), higher multidimensional disease severity and higher dyspnea level. Task-related oxygen uptake was also similar between the COPD patients with and without comorbidities (22). Although the increases in dyspnea and fatigue perceptions in the ADL simulation test were similar between the two groups in our study, fewer cycles completed in the ADL simulation test by the geriatric COPD patients can be due to impairments in ventilatory mechanics and decreases in performance can be due to reduced muscle strength in both upper and lower limbs and changes in agility and endurance with advancing age (18). The comparable changes in physiological variables during ADL tests between the groups can be related to similar physical characteristics, MMRC dyspnea scores, disease severity and comorbidities. Although studies that compare upper extremity activity performance in elderly COPD patients and healthy subjects were found in literature, our study showed the decrease in activity performance level in arm tasks by the geriatric COPD patients compared to the non-geriatric COPD patients with same obstruction level.

Reduced physical performance level was found to be associated with higher Charlson score, metabolic disease, anxiety and osteoporosis in patients with COPD (15). In a study that investigated the impact of COPD on ADL in 1057 patients (mean age, 67±9 years), the patients with more negatively affected ADL were older; they had a lower socioeconomic status, lower body mass index, lower general health status, more severe level of COPD and more severe dyspnea. Investigators also showed that about 70% of disabled COPD patients had at least one other chronic disease (23). Although the Charlson comorbidity scores of the geriatric and the non-geriatric groups in our study were comparable, the percentage of patients with CCI>2 was higher in the geriatric group. In our study, higher comorbidity rates in the elderly COPD patients can explain their lower performance in both ADL tests used.

Current knowledge suggests that ageing is a determinant of the progression of COPD and that management of an older COPD population requires different treatment strategies (1). In a cross-sectional study in 13,624 COPD patients aged between 40 and 79 years, higher rates of limitation in basic ADL, instrumental ADL and mobility disability are seen among COPD patients compared with the general population. The researchers showed that advanced age increases the risk of disability in patients with COPD (24). The rapid increase in disabilities commonly associated with COPD requires urgent awareness among healthcare professionals. The ability to determine the physical capability of an elderly person with COPD is an essential aspect for planning clinical treatment and protecting against negative outcomes (3).

A limitation of our study was that we did not assess other factors besides older age that can affect the patient's functional status (24); e.g. psychological state, health status, environmental factors, self- efficacy, balance and fall risk. Further data are needed for understanding the factors that limit activity performance in elderly COPD patients compared with non-elderly patients. In addition, we used CCI for evaluating comorbidities in the patients with COPD. This tool does not assess comorbid conditions such as hypertension and osteoporosis that are common in patients with COPD and negatively influence physical performance. Other indices that account for a wide range of comorbid conditions are recommended for use in future studies.

In conclusion, this study showed that ADL performance was reduced in the geriatric patients with COPD compared with the non-geriatric patients. The Glittre ADL Test is a disease-specific ADL test and assesses basic ADL-type activities and mobility; the ADL Simulation Test evaluates unsupported arm activities. Both tests can be effectively used in clinical settings for acquiring information about the patient's ability to perform ADL. We think that showing the distinctive characteristics of these ADL tests for elderly patients with COPD guides their selection for evaluating ADL in clinical settings and for designing goal-appropriate treatment within pulmonary rehabilitation programs.

Conflict of Interest

The authors have no financial disclosures to declare and no conflicts of interest to report.

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