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www.turkgeriatri.org
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editor@geriatri.dergisi.org

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EDITORIAL ARTICLE

HOW WILL TECHNOLOGY BE USED FOR AGED PEOPLE'S HEALTH RELATED NEEDS?

Twenty first century has changed life in many aspects one of which is very linked to the technological improvements (1). Technology, if used in "good/intended" direction, is expected to help aged people to maximize their potential in life (2) and to maintain independency in their lives even they have chronic diseases (1). Aged people may need any type of external support in two basic situations including the need for continuation of successful and healthy aging as well as ill/sick/disabled elderly people's needs (1).

Successful aging has three dimensions including less frequency in disease and disabilities, sufficient capacity in cognitive and physical dimensions of health, and social activity participation (3). The independency and the social inclusion of the elderly people determine their quality of life very closely (4). Nevertheless, aged people frequently face with more than one disease concurrently and such conditions make the situation complex to achieve the goal of successful aging.

There are also inequalities between the countries in disease profiles of the aged population. Low and middle income old age people triplicate the number of years lost to premature death caused by heart diseases, stroke, and chronic lung diseases. Visual and hearing loss problems are also more frequent compared to the high income countries (5). Long term care need increases every day as the population is aging all around the world (6). Comorbidity is frequently associated with dying risk, lower functional status, lower quality of life and more frequent health service utilization (7). Almost 80% of the older people has at least one chronic condition whereas the percent decreases to 50 who have at least two chronic conditions (8). Another study highlights the multi-morbidity range in the elderly as 55 to 98%. Being women and belonging to low socio-economic status make the situation worse (9). The chronic conditions like cognitive impairment, falls, incontinence, vision or hearing impairment, low body mass index, dizziness increase the limitation of daily living (10).

In such chronic conditions, medication optimizing, patient monitoring, post-acute care transition are among prior aspects of technology use among elderly (11). There are many examples in different countries. For example, In New York City, a group of elderly people whose ages are between 64 and 94 use the interactive online games to dance. The program they use help them to monitor the benefits of activity, and to manage with their chronic conditions via a number of information like glucose level, blood pressure, etc (12).

Briefly, technology can be used in prior items for aged people written below:

1. Hearing aids
2. Visual aids
3. Bed-chair-sitting-standing-walking aids
4. Bathroom aids to prevent falls
5. Warning sensors for smoke, fire, etc especially in the kitchen
6. Early warning technological aids to remind aged people the hours of medication, etc.
7. Aids developed in emergency situations including disasters

Correspondance

Dilek ASLAN
Hacettepe University, Faculty of Medicine, Department of Public Health ANKARA

Phone: 0312 305 15 95
e-mail: diaslan.dr@gmail.com

8. Early warning technological aids linked to emergency departments in case of emergency situation occurred at home
9. Technology developed for clinical settings including internal, surgical medicine practices
10. Smartphone reminders used for aged people with memory difficulties (13)
11. Outside environmental arrangements for aged people

All types of recommendations/interventions using technology should be experimented via evidence based medicine principles before being available and eligible. Technology in any form should not be used as a threat to privacy (14). Furthermore, any condition(s) causing/ending with any ethical dilemmas should be avoided. Finally, health services which the aged people need should be accessible and covered by the social security systems. Therefore, strong regulations are required which the state bodies are expected to take the major roles.

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Tezcan KAYA[1]
Savaş SİPAHİ[2]
Cengiz KARACAER[3]
Ahmet NALBANT[3]
Ceyhun VARIM[1]
Hakan CİNEMRE[1]
Ali TAMER[1]

Correspondance

Tezcan KAYA
Sakarya University, Faculty of Medicine, Department of Internal Medicine, SAKARYA

Phone: 0264 295 66 30
e-mail: tezcankaya@gmail.com

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[1] Sakarya University, Faculty of Medicine, Department of Internal Medicine, SAKARYA
[2] Sakarya University, Faculty of Medicine, Department of Internal Medicine, Nephrology Division, SAKARYA
[3] Sakarya University, Training and Research Hospital, Department of Internal Medicine, SAKARYA

RESEARCH

MALNUTRITION-INFLAMMATION SCORE, ANTHROPOMETRIC INDICES, AND ERYTHROPOIETIN REQUIREMENT IN GERIATRIC HEMODIALYSIS PATIENTS

ABSTRACT

Introduction: Studies have demonstrated that there is a correlation between malnutrition, inflammation, and erythropoietin requirement in adult hemodialysis patients. However, in geriatric hemodialysis patients, no evident data has been found associated with this relationship. The purpose of this study is to investigate the relation between malnutrition-inflammation score, erythropoietin requirement, and erythropoietin resistance in geriatric hemodialysis patients.

Materials and Method: One hundred fifty-four adult hemodialysis patients were included in this cross-sectional study. Erythropoietin resistance index, weekly erythropoietin dose, weekly erythropoietin dose per weight, and malnutrition-inflammation score were calculated for all patients. Measurements of laboratory and anthropometric parameters associated with nutrition and inflammation were performed.

Results: Mean age of 154 patients included in the study was 59.5±14.5 years; 81 were male and 68 were geriatric (age ≥65 years). The median duration of dialysis was 36 months (interquartile range, 18–76). Mean malnutrition-inflammation score was found to be higher in geriatric patients than in adult patients (p=0.004). Malnutrition-inflammation score was determined in correlation with weekly erythropoietin dose per weight in both geriatric and adult patient groups (p<0.001, r=0.484; p=0.029, r=0.235, respectively). Malnutrition-inflammation score was determined in correlation with erythropoietin resistance index in both geriatric and adult patient groups (p<0.001, r=0.497; p=0.014, r=0.497, respectively).

Conclusions: In both geriatric and adult (<65 years) hemodialysis patients, malnutrition-inflammation score is correlated with weekly erythropoietin dose per weight and erythropoietin resistance index. Moreover, malnutrition and inflammation is more often observed among geriatric hemodialysis patients compared with adult (<65 years) hemodialysis patients.

Key Words: Erythropoietin; Geriatrics; Renal Dialysis; Malnutrition; Inflammation.

ARAŞTIRMA

GERİATRİK HEMODİYALİZ HASTALARINDA MALNÜTRİSYON İNFLAMASYON SKORU, ANTROPOMETRİK BELİRTEÇLER VE ERİTROPOİETİN İHTİYACI

ÖZ

Giriş: Çalışmalarda erişkin hemodiyaliz hastalarında malnütrisyon ve inflamasyon ile eritropoietin ihtiyacı arasında korelasyon olduğu gösterilmiştir. Fakat geriatrik hemodiyaliz hastalarında bu ilişki ile ilgili belirgin veriler bulunmamaktadır. Bu çalışmanın amacı geriatrik hemodiyaliz hastalarında malnutrisyon inflamasyon skoru, eritropoietin ihtiyacı ve eritropoietin direnci ilişkisinin araştırılmasıdır.

Gereç ve Yöntem: Bu kesitsel çalışmaya yüz elli dört erişkin hemodiyaliz hastası alındı. Hastaların eritropoietin direnç indeksi, haftalık eritropoietin dozu, haftalık kilo başına eritropoietin dozu ve malnutrisyon inflamasyon skoru hesaplandı. Hastaların nütrisyon ve inflamasyon ilişkili laboratuar ve antropometrik parametreleri ölçüldü.

Bulgular: Çalışmaya alınan 154 hastanın yaş ortalaması 59,5±14,5 yıl, 81'i erkek, 68'i geriatrik (yaş ≥65 yıl) idi. Ortalama diyaliz süresi 36 aydı (çeyreklikler arası, 18-76). Geriatrik hastalarda, malnutrisyon inflamasyon skoru ortalaması daha yüksek bulundu (p=0,004). Malnutrisyon inflamasyon skoru, geriatrik ve erişkin hasta gruplarının her ikisinde de haftalık kilo başına eritropoietin dozu ile korele bulundu (sırasıyla p<0,01, r=0,484; p=0,029, r=0,235). Malnutrisyon inflamasyon skoru, geriatrik ve erişkin hasta gruplarının her ikisinde de eritropoietin direnç indeksi ile korele bulundu (sırasıyla p<0,01, r=0,497; p=0,014, r=0,497).

Sonuç: Malnutrisyon inflamasyon skoru, geriatrik ve erişkin (yaş<65) hemodiyaliz hastalarının her ikisinde de haftalık kilo başına eritropoietin dozu ve eritropoietin direnç indeksi ile koreledir. Ayrıca, malnütrisyon ve inflamasyon geriatrik hemodiyaliz hastalarında erişkin (yaş<65) hemodiyaliz hastalarından daha fazla görülmektedir.

Anahtar Sözcükler: Eritropoietin; Geriatri; Hemodiyaliz; Malnütrisyon; İnflamasyon.

Introduction

Recently, a significant increase in geriatric patient population undergoing hemodialysis due to end stage renal disease (ESRD) has been observed worldwide (1). Anemia in patients with chronic kidney disease (CKD) is a frequent occurrence as a result of relative deficiency of erythropoietin (EPO). Therefore, in treatment of renal anemia, the use of erythropoiesis-stimulating agents (ESA) is now standard of care (2). However, ESA might result in low response rates in some patients due to factors such as iron deficiency, protein-energy malnutrition (PEM), inflammation, infection, vitamin B_{12} or folate deficiency, serious hyperparathyroidism, and insufficient dialysis (3). In ESA resistance, the target hemoglobin (Hb) level cannot be achieved despite administration of ESA or, alternatively, high doses of ESA might be required (3). Some studies have reported a relationship between increase in mortality and usage of high-dose recombinant human erythropoietin (rHu-EPO) even though the level of Hb is in the expected range (4,5).

EPO resistance index (ERI) is calculated as the weekly dose of EPO per kilogram (kg) of body weight divided by Hb level (g/dL) (6). ERI is used in the analysis of rHu-EPO resistance and has shown to have a relationship with mortality and comorbidity in hemodialysis patients (6). In addition, as reasons for variance in patients' response to rHu-EPO is complex and multi-factorial, it could not be explained completely (3). The existence of anemia in hemodialysis patients reduces quality of life, worsens cardiovascular morbidity, and is an independent indicator for mortality (7).

Co-occurrence of malnutrition and inflammation is designated as malnutrition–inflammation complex syndrome (MICS) in maintenance hemodialysis patients. It has been shown that MICS is related to acceleration in atherosclerosis, mortality, and morbidity (8). Malnutrition-inflammation score (MIS) is a comprehensive and specific scoring system used for evaluation of MICS in hemodialysis patients (9). MIS is associated with endothelial dysfunction, coronary artery disease, quality of life, mortality, sleep disorders, depression, and decreased exercise capacity in maintenance dialysis patients (9-11).

In two studies, MIS was found to be associated with EPO hyporesponsiveness and rHu-EPO dose requirement (12,13). However, there has been no data regarding such an association in geriatric hemodialysis patients. Moreover, the relationship between MIS and ERI has not been identified precisely in geriatric hemodialysis patients. In geriatric patients, there are many unexplained aspects of anemia etiology and response to treatment (14). The objective of this study was to investigate the effect of malnutrition and inflammation defined as MIS on EPO requirement and EPO resistance in geriatric hemodialysis patients.

Materials and Method

Patients

One hundred fifty-four adult patients (age ≥18 years), who underwent conventional hemodialysis three times a week for at least six months were included in this cross-sectional study. The study received approval from our university hospital ethics committee and informed consent was obtained from all pateints before participation. Study data were collected from patients at three different hemodialysis centers in our city, from December 2013 to January 2014.

Duration of each dialysis session was 4–5 hours with blood flow rate of 300–400 mL/min, and standard bicarbonate dialysis solution was used. Patients with iron deficiency, folate deficiency, hemolysis, vitamin B_{12} deficiency, malignancy, specific infection/inflammation (C-reactive protein (CRP)>10 mg/L), hospitalization, or transfusion history within last three months, insufficient hemodialysis (Kt/V<1.2), serious hyperparathyroidism (parathormone (PTH) ≥800 pg/dl), or thyroid dysfunction were excluded. Also patients receiving parenteral nutrition, who were unable to answer the questions due to senility or dementia, who had not received any rHu-EPO treatment within last three months, or who had chronic gastrointestinal blood loss were excluded. All patients included were clinically euvolemic. Demographic characteristics of patients, such as age, gender, and dialysis duration, were recorded. Patients were divided into two groups as adult (age <65 years) and geriatric (age ≥65 years).

Laboratory Evaluation

Before the dialysis session, blood samples for routine biochemical parameters including creatinine, total cholesterol, triglyceride, PTH, ferritin, albumin, calcium, phosphorus, Hb, hematocrit (Hct), total iron-binding capacity (TIBC), and CRP were drawn from an antecubital vein of all participants after overnight fasting. CRP was assayed by immunoturbidimetric method (normal range of CRP, 0–5 mg/L). Serum albumin levels were measured by the quantitative colorimetric method. All the other laboratory parameters were studied by using standard automated methods. The mean values of three months were examined for laboratory values. After the dialysis session, blood was taken to determine post- dialysis ure-



a and calculate Kt/V of urea. Laboratory results were evaluated by recording in patient cards.

Erythropoietin Resistance Index and Erythropoietin Requirement

Patients were administered EPO alpha, EPO beta, or darbepoetin alfa as ESA. Target Hb level was 11–12 g/dl. Medicine dose of those administered darbepoetin alfa was multiplied by 200 and converted into unit dose (15). Total dose of rHu-EPO administered for three months to all patients included in the study was divided by 12 to determine the weekly mean rHu-EPO dose (EPO dose/week; U/week). By dividing weekly rHu-EPO doses by the weight of each patient, EPO dose per body weight was calculated (U/week/kg). ERI was calculated by dividing weekly EPO dose (U/week/kg) into Hb (g/dl) (6).

Malnutrition-Inflammation Score

MIS is a scale in which 10 parameters are evaluated by giving scores between 0 (normal) and 3 (severely abnormal) (9). Seven out of ten parameters include following questions and examinations in subjective global assessment (SGA): weight loss within last six months, decrease in eating, existence of gastrointestinal symptoms such as nausea and diarrhea, comorbidity, functional capacity, loss of subcutaneous fatty tissue, and loss of muscle. The additional three parameters were body mass index (BMI), serum albumin level, and serum TIBC. The sum of all 10 MIS components ranges from 0 (normal) to 30 (severely malnourished and inflammation status). MIS of all patients was calculated accordingly.

Anthropometric Measurements

Mid-arm circumference (MAC), triceps skin-fold thickness (TSF), calf circumference, body weight, and height were measured as anthropometric measurements. Anthropometric parameters were measured 10–20 minutes after the completion of dialysis. MAC and calf circumference were measured using a metal tape measure. TSF was measured using a caliper. All measurements were repeated three times from the non-access arm and the mean was recorded. Mid-arm muscle circumference (MAMC) was calculated by the following formula: MAMC=MAC-(3.1415 x TSF) (16). The body mass index (BMI) was calculated as the ratio between body weight in kilograms and the square of height in meters (kg/m^2). Anthropometric parameters were measured by an experienced nutrition nurse.

Statistical Analysis

Normal distributed continuous variables were reported as mean ± SD whereas non-normally distributed variables were reported as medians (interquartile range, IQR). Differences in normal distributed continuous variables between groups were determined by using unpaired t-test whereas differences in non-normal distributed continuous variables were compared by using Mann-Whitney U-test. Categorical variables were analysed by Chi-square test. Pearson's correlation was used to assess the strength of association between MIS, EPO requirement, and anthropometric parameters. A p value of <0.05 was considered as statistically significant. SPSS software (Statistical Package for the Social Sciences, version 17.0, SSPS Inc., Chicago, Ill, USA) was used to conduct the statistical analysis.

RESULTS

The mean age of 154 patients included in the study was 59.5±14.5 years (range: 21–87); 81 were male (52.5%) and 68 were geriatric. The median duration of dialysis was 36 months (IQR, 18–76). Table 1 illustrates the demographic and clinical characteristics of geriatric and adult patients. Albumin and creatinine of geriatric patient group were lower than those of adult group ($p=0.001$, $p < 0.001$, respectively). Table 2 illustrates MIS, ERI, weekly EPO dose, and anthropometric parameters of geriatric and adult patients.

MIS was higher in geriatric patients than adult patients ($p=0.004$),whereas MAC, TSF, and MAMC were lower in geriatic patients than in adult patients ($p=0.004$, $p=0.045$, and $p=0.009$, respectively) (Table 2). However, EPO dose per body weight and ERI were not different in geriatric patients compared with those in adult hemodialysis patients (Table 2). MIS was in positive correlation with hemodialysis duration ($p=0.039$, $r=0.224$) whereas it was in negative correlation with albumin and BMI ($p=0.003$, $r=-0.313$; $p=0.000$, $r=-0.387$, respectively) in adult patients. Similarly, in geriatric patient group, MIS was in positive correlation with hemodialysis duration ($p=0.006$, $r=0.329$) and in negative correlation with albumin and BMI ($p=0.000$, $r=-0.521$; $p=0.000$, $r=-0.425$, respectively). Moreover, while there was minimal negative correlation between MIS and total cholesterol in geriatric patients ($p=0.050$, $r=-0.239$), there was no significant correlation in adult patients.

MIS was correlated with EPO dose per body weight and ERI in both adult and geriatric patients (Table 3) (Figure 1). Albumin, which is a biochemical indicator of nutritional sta-

Table 1— Demographic, Clinical, and Biochemical Parameters of Patients in Geriatric and Adult Hemodialysis Patients.

Parameter	Age < 65 (n=86)	Age ≥ 65 (n=68)	p
Age (year)	49.3 ± 10.3	72.4 ± 6.6	<0.001*
Gender (female/male)	36/50	37/31	0.083
Dialysis duration (month)	35 (18–85)	36 (18–67.2)	0.610
Diabetes, n (%)	35 (40.7)	28 (41.2)	0.541
Ischemic heart disease, n (%)	13 (15.1)	18 (26.5)	0.062
Hematocrit (%)	32.2 ± 3.1	31.5 ± 3.8	0.206
Hemoglobulin (g/dL)	10.6 ± 1	10.3 ± 1.1	0.072
Serum ferritin (ng/mL)	453 ± 184	435 ± 191	0.602
TIBC (µg/dL)	183 ± 42	182 ± 44	0.754
Albumin (g/dL)	4 ± 0.4	3.8 ± 0.4	0.001*
Total cholesterol (mg/dL)	166 ± 45	179 ± 51	0.088
Triglyceride (mg/dL)	149 (110–215)	129 (104–184)	0.158
Creatinine (mg/dL)	8.2 ± 1.8	6.9 ± 1.7	<0.001*
CRP (mg/L)	4 (2–7.4)	4.4 (1.8–8.8)	0.494
Calcium (mg/dL)	8.5 ± 0.7	8.5 ± 0.8	0.820
Phosphorus (mg/dL)	5 (3.8–5.8)	5.3 (4.4–6.4)	0.105
PTH (pg/mL)	361 ± 210	356 ± 222	0.771
Kt/V	1.5 (1.3–1.6)	1.5 (1.3–1.6)	0.955

*p < 0.05. TIBC: total iron binding capacity, CRP: C-reactive protein, PTH: Parathyroid hormone. Data are expressed as mean ± standard deviation or median (interquartile range).

Table 2— Malnutrition Inflammation Score, Erythropoietin Resistance Index, Erythropoietin Requirement, and Anthropometric Parameters of Patients in Geriatric and Adult Hemodialysis Patients.

Parameter	Age < 65 (n=86)	Age ≥ 65 (n=68)	p
MIS	5 (4–7.2)	7 (5–11.7)	0.004*
EPO dose (U/week)	8000 (6000–9000)	8000 (5250–8000)	0.768
EPO dose per body weight (EPO dose/kg)	110 ± 40	116 ± 45	0.360
ERI (EPO dose per body weight / Hb)	10.5 ± 4.1	11.7 ± 4.5	0.093
BMI (kg/m2)	24.5 ± 4.7	24.3 ± 4.5	0.786
Weight (kg)	67.6 ± 15.4	63.2 ± 13.3	0.060
MAC (cm)	27.2 ± 3.5	25.6 ± 3.5	0.004*
TSF (mm)	12 (9.7–16)	10 (8–16)	0.045*
MAMC (cm)	22.9 (21.2–24.6)	21.5 (20.1–23.2)	0.009*
Calf circumference (cm)	32.3 ± 3.6	33.3 ± 3.8	0.148

*p < 0.05. MIS: Malnutrition inflammation score, EPO: Erythropoietin, ERI: Erythropoietin resistance index, Hb: Hemoglobin, BMI: Body mass index, MAC: Mid-arm circumference, TSF: Triceps skinfold thickness, MAMC: Mid arm muscle circumference. Data are expressed as mean ± standard deviation or median (interquartile range).

te, was in negative correlation with EPO dose per body weight and ERI in geriatric patients (Table 3). Furthermore, in geriatric patient group, BMI, which is an anthropometric parameter, was in negative correlation with EPO dose per body weight and ERI (Table 3).

Discussion

In this study, MIS was found to be in significant correlation with EPO dose per body weight and ERI in both geriatric and adult patient groups. Moreover, in geriatric patients, EPO dose per body weight and ERI values were higher but

Table 3— Correlation Coefficients Between Erythropoietin Requirement, Erythropoietin Resistance Index and MIS Value, Anthropometric and Laboratory Parameters in Hemodialysis Patients.

	EPO Dose/Week		EPO Dose Per Body Weight		EPO Resistance Index	
	Age < 65	**Age ≥ 65**	**Age < 65**	**Age ≥ 65**	**Age < 65**	**Age ≥ 65**
MIS	0.006	0.223	0.235*	0.484*	0.264*	0.497*
	(p=0.959)	(p=0.068)	(p=0.029)	(p<0.01)	(p=0.014)	(p=0<0.01)
BMI (kg/m2)	0.265*	0.016	-0.319*	-0.401*	0.248*	-0.402*
	(p=0.014)	(p=0.899)	(p=0.003)	(p=0.001)	-(p=0.022)	(p=0.001)
TSF (mm)	0.051	-0.088	0.007	-0.155	0.037	-0.151
	(p=0.638)	(p=0.476)	(p=0.950)	(p=0.208)	(p=0.736)	(p=0.220)
MAC (cm)	0.106	0.076	0.038	0.016	0.024	0.010
	(p=0.330)	(p=0.539)	(p=0.730	(p=0.900)	(p=0.824)	(p=0.937)
Albumin (g/L)	-0.061	-0.216	-0.122	-0.307*	-0.148	-0.348*
	(p=0.574)	(p=0.077)	(p=0.265)	(p=0.011)	(p=0.172)	(p=0.004)
Hemoglobin (g/dL)	-0.280*	-0.325*	-0.241*	-0.366*	-0.490*	-0.584*
	(p=0.009)	(p=0.007)	(p=0.025)	(p=0.002)	(p<0.01)	(p<0.01)

Pearson's correlation test was used to determine correlation between parameters. P=values are shown in parentheses after each r value. *Statistically significant r values (p<0.05).
MIS: Malnutrition inflammation score, EPO: Erythropoietin, BMI: Body mass index, TSF: Triceps skinfold thickness, MAC: Mid-arm circumference.

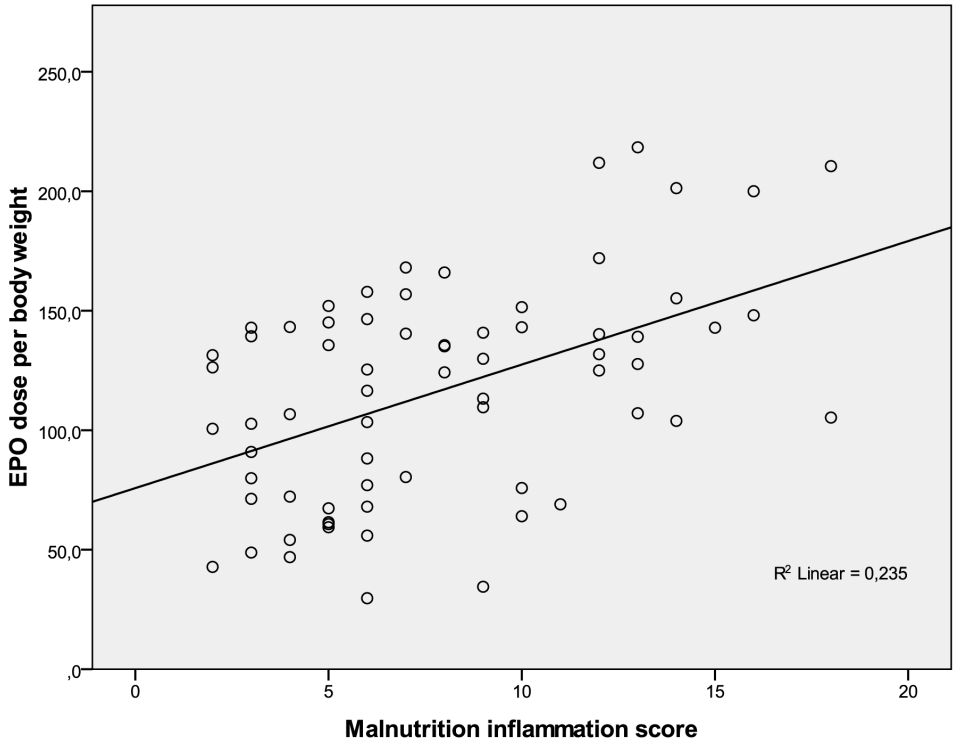


Figure 1— The scatter plot graph of correlation between malnutrition inflammation score and erythropoietin (EPO) dose per body weight per week in geriatric hemodialysis patients.

not statistically significant. Around the world, the rate of geriatric patients who undergo renal replacement treatment is over 30% in most ESRD registries, and the rate continues to increase (1). In the elderly, pathophysiology of diseases follows a course different from that observed in young people due to changes such as functional, biochemical, and morphological (14). To our best knowledge, there has been no other study that investigates the relationship between MIS and EPO requirements in geriatric hemodialysis patients. In the study conducted by Kalantar Zadeh et al. (13), a significant correlation was reported between MIS and EPO hyporesponsiveness, and the mean age of patients was 54.7 ± 14.5. A study by Akgul et al. (12) found the same correlation in hemodialysis patients without inflammation, with the average age being 49.1 ± 11.4. Our study is important in terms of showing such a relationship in geriatric hemodialysis patient population, as well.

MIS was found in significant correlation with ERI in both geriatric and younger patients (<65 years) in this study. Moreover, ERI in geriatric patients was higher, but was not statistically significant. The ERI can be easily calculated in the clinic and is directly related to comorbidity and mortality in hemodialysis patients (6). The reasons for variance of responses to EPO in hemodialysis patients could not be explained precisely (3). EPO resistance and attainable Hb values are strong predictors for mortality risk (17). In hemodialysis patients, common reasons for EPO resistance include iron deficiency, infection/inflammation, chronic blood loss, folate or vitamin B12 deficiency, hemoglobinopathies, aluminum toxicity, and medicines (3,18). In the analysis of data of DOPPS III study, in which 8161 hemodialysis patients were evaluated, ERI was higher in Japanese geriatric patients compared to younger patients, but as in our study, no significant difference was found in Europe, Australia, New Zealand, and North America (1). Differences in clinical practices or characteristics of cases such as target Hb values could affect ESA administration.

In our study, we found BMI is in negative correlation with EPO dose per body weight and ERI in geriatric patient group. BMI is a conventional method used in the evaluation of nutritional state but it is not sensitive (19). Locatelli et al. (20) have shown that BMI and EPO hyporesponsiveness are independently related. Moreover, it has been reported that there is an inverse correlation between BMI and anemia control in hemodialysis patients (21).

In this study, we found that MICS was more common in geriatric patients than younger adults. Median MIS was 7 (IQR, 5–11.7) in geriatric hemodialysis patients whereas it was 5 (IQR, 4–7.2) in adult patients. In their study, Kalantar Zadeh et al. (13) determined mean MIS as 8.3 ± 4.2 in hemodialysis patients. In some studies, it has been shown that malnutrition is inversely proportional to age (22). However, other studies demonstrated that age does not affect malnutrition incidence (23). MIS is a comprehensive, quantitative, and easy method used to evaluate inflammation and nutrition states of hemodialysis patients (9). In recent studies, it has been demonstrated that MIS bears a relationship to long-term mortality in dialysis patients (11,24).

In this study, albumin of geriatric patients were significantly lower than that of adult patients. Furthermore, we have found MIS in significant negative correlation with albumin in both groups. Albumin is one of biochemical parameters that can show malnutrition and inflammation in patients but it is affected by the presence of edema, liver disease, and chronic inflammation (25). In this study, albumin demonstrated a significantly negative correlation with EPO dose per body weight and ERI in geriatric patients. Results of this study support the idea that malnutrition increases EPO resistance.

This study has some limitations. First, the number of patients is low and data were collected from a single region. Second, in this cross-sectional study, three months of patient data were analysed. Inflammation and malnutrition in hemodialysis patients is a dynamic process and may require longer follow-up.

In conclusion, MIS is in correlation with EPO dose per body weight and ERI in both adult (<65 years) and geriatric hemodialysis patient populations. Moreover, MICS is significantly more common among geriatric hemodialysis patients compared with adult hemodialysis patients (<65 years).

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Ümit Yener TEKDOĞAN[1]
Murat BAĞCIOĞLU[1]
Serkan ÖZCAN[2]
Mevlana Derya BALBAY[3]

RESEARCH

THE EFFECT OF ORAL GLUCOSE TOLERANCE TEST ON INSULIN AND SOME RELATED INDICATORS IN ELDERY MALE PATIENTS WITH PROSTATE CANCER AND BENIGN PROSTAT HYPERPLASIA

ABSTRACT

Introduction: Insulin, insulin like growth factor-1 and insulin like growth factor binding protein-3 were associated with prostate cancer. The aim of our study was to define the relationship between insulin like growth factor-1 and insulin like growth factor binding protein-3 serum levels, and correlate these proteins with the oral glucose tolerance test.

Materials and Method: Eighty-four male patients who had undergone prostate biopsy were included in the retrospective study. Oral GlucoseToleranceTest was done. Fasting, 1-hour and 2-hour plasma samples were used to measure serum levels of insulin, insulin like growth factor-1 and insulin like growth factor binding protein-3. The patients were divided into two groups: Benign and Malign.

Results: The mean age was 64.5±0.91 years. There was a significant difference between benign and malign groups in prostate specific antigen levels—6.14±0.7 ng/ml, and 11.6±2.2 ng/ml (p=0.001). The mean insulin level for 2 hour in malign group was significantly lower than that of benign group (81.9±12 µIU/ml and 57.4±17.2 µIU/ml (p=0.033) . Insuline like growth factor binding protein-3 levels after glucose tolerance test were 4725.9±504.4 ng/ml and 3929.4±346.5 ng/ml for 1 hour and 2 hours, respectively, and significantly lower in benign group (p=0.046).

Conclusion: Insulin, insulin like growth factor-1 and insulin like growth factor binding protein-3 remain far away as being defined as tumor markers for prostate cancer since findings are still inconclusive and unclear. Future studies on the their axis and its genetics are obviously needed to understand if there is any role of these substances in the development of prostate cancer.

Key Words: Prostatic Hyperplasia; Prostatic Neoplasms; Insulin; Insulin-Like Growth Factor I; Insulin-Like Growth Factor Binding Protein 3.

ARAŞTIRMA

PROSTAT KANSERİ VE BENİGN PROSTAT HİPERPLAZİSİ OLAN YAŞLI ERKEK HASTALARDA ORAL GLUKOZ TOLERANS TESTİNİN İNSÜLİN VE İLGİLİ BAZI BELİRTEÇLERE ETKİSİ

ÖZ

Giriş: İnsülin, insülin benzeri büyüme faktörü-1 ve insülin benzeri büyüme faktörü bağlayıcı protein-3'ün prostat kanseri ile ilişkisi bildirilmiştir. Çalışmamızın amacı, insülin benzeri büyüme faktörü-1 ve insülin benzeri büyüme faktörü bağlayıcı protein-3 serum miktarlarının benign ve malign prostat hastalıklarında oral glukoz tolerans testi ile etkileşimini incelemektir.

Gereç ve Yöntem: Prostat biyopsisi yapılan 84 hasta çalışmaya dahil edildi ve retrospektif olarak incelendi. Tüm hastalardan alınan açlık, glukoz tolerans testi sonrası birinci ve ikinci saat serum kan örneklerinden, insülin, insülin benzeri büyüme faktörü-1 ve insulin benzeri büyüme faktörü bağlayıcı protein-3 düzeyleri ölçüldü. Hastalar, patoloji sonuçlarına göre benign ve malign olarak ayrıldı.

Bulgular: Hastaların yaş ortalaması 64,5±0,91 yıl olarak bulundu. Prostat kanserli grupta prostat spesifik antijen düzeyleri 11,6±2,2 ng/ml ile ortalaması 6,14±0,7 ng/ml olan benign gruptan anlamlı yüksekti (p=0,001). Serum insülin düzeyleri prostat kanserli grupta glukoz tolerans testi sonrası ikinci saatte benign gruptan anlamlı düşük bulundu (57,4±17,2 µIU/ml, 81,9±12 µIU/ml sırasıyla, p=0,033). Glukoz tolerans testi sonrası 1 ve 2. saatlerdeki insülin benzeri büyüme faktörü bağlayıcı protein-3 düzeyleri benign grupta anlamlı düşük bulundu (4725±504,4 ng/ml, 3929,4±346,5 ng/ml, sırasıyla, p=0,046).

Sonuç: İnsülin, insülin benzeri büyüme faktörü-1 ve insülin benzeri büyüme faktörü bağlayıcı protein-3 serum düzeyleri prostat kanseri için tümör belirteci olmaktan uzaktır, sonuçlar şüphelidir ve açık değildir. Gelecekte büyüme faktör yolakları ve genetiği üzerine yapılacak çalışmalar, bu proteinlerin prostat kanserinin gelişiminde eğer varsa rollerinin anlaşılması için gereklidir.

Anahtar Sözcükler: Benign Prostat Hiperplazisi; Prostat Kanseri; İnsülin, IGF-1, IGFBP-3.

Correspondance

Ümit Yener TEKDOĞAN
Kafkas University, Faculty of Medicine, Department of Urology, KARS

Phone: 0474 225 11 94
e-mail: yenertekdogan@yahoo.com

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[1] Kafkas University, Faculty of Medicine, Department of Urology, KARS
[2] Artvin State Hospital, Urology Clinic, ARTVİN
[3] Memorial Şişli Hospital, Urology Clinic, İSTANBUL

Introduction

Prostate related problems are quite common in men over age 50 (1). Prostate specific antigen (PSA) is the most common tumor marker for prostate cancer; in addition, PSA levels may be afflicted by several other conditions like benign prostatic hyperplasia (BPH), prostatitis, prostate biopsy, androgen deprivation therapy. Therefore, PSA can be defined as an organ-specific marker, instead of being defined as a disease specific marker, and PSA use in daily practice should be carefully considered (2).

The mitogenic effects of insulin and insulin-like growth factor-1 (IGF-1) on cells are well known (3,4). Insulin and IGF-1 were also reported as potential markers for prostate cancer by some authors (3,5,6). Correlated with IGF is the insulin-like growth factor binding protein-3 (IGFBP-3), a protein that transports more than 90% of IGF-1 (7). IGFBP-3 was reported to have a protective role against prostate cancer (8). Serum IGF-1 levels may change with age and nutrition like insulin, which is the most powerful regulator for glucose metabolism (7,9,10). The production of IGFs, although mainly dependent on growth hormone, can be manipulated by other factors. Their circulation levels are dependent on both production and degradation of their binding proteins. The circulation levels of all of them vary throughout life, increasing from birth to their peak at puberty and decreasing steadily after the third decade (11). Also, their serum levels may changes in the systemic inflammatory response (12). IGF-1 is synthesized primarily in the liver in a 1:2 molar ratio, along with most other viscera, including the prostate (11).

The aim of our study was to define the relationship between total PSA levels, as well as those of IGF-1 and IGF-BP3 levels, and correlate these with an oral glucose tolerance test (OGTT).

Materials and Method

After approval by the ethic committee, we performed a retrospective study between 2007 and 2011 at Numune Training and Research Hospital, Ankara and Atatürk Training and Research Hospital, Ankara and Kafkas University Medicine Faculty, Kars. Patients were selected from a study that evaluate the transrectal ultrasound guided prostate biopsy complications and these patients were with suspicious of diabetes mellitus and were selected to perform OGTT. Eighty-four male patients, who underwent transrectal ultrasound guided prostate biopsy for abnormal digital rectal examination findings or increased PSA levels, were included in the study. Urine analyses and routine biochemical tests were also done on all patients. Patients with diabetes mellitus, liver disease, cachexia, obesity, active infection, and metastatic prostate cancer were excluded from the study. (Patients were defined as obese or cachectic based on body mass index). All patients were instructed to fast for 8 hours prior to the glucose tolerance test. A baseline 5 cc blood sample was taken from antecubital vein initially. The patients were then given 75 grams oral dose of glucose solution to drink within 5 minutes. Afterwards, 1 hour and 2 hour blood samples were taken. Plasma samples were preserved at -80 ºC after 20 minutes of centrifuge at 1500 g. PSA, insulin levels were measured. IGF-1 and IGF-BP3 levels were also measured from the samples that were preserved at at -80 ºC. Chemiluminescence, radio immunoassay and immunoradiometric assay (IRMA) were used for determination of PSA, insulin, IGF-1 and IGFBP-3 levels, respectively. Fasting, 1-hour and 2-hour plasma samples were used to measure insulin, IGF-1 and IGFBP-3 levels. All patients underwent transrectal ultrasound guided prostate biopsies (10 cores). The patients were divided into two groups according to biopsy pathology: BPH (group 1) and Pca (group 2). SPSS software, version 21 (SPSS Inc, Chicago, IL) Mann-Whitney *U*-test and Wilcoxon Signed Test was used to compare differences in age, PSA, insulin, IGF-1 and IGFBP-3 levels between groups. Statistically significant levels were set at a P value of < 0.05.

Results

Thirty-nine patients with Pca and 45 patients with BPH were included in the study. The mean age was 64.5±0.91 years, for all patients; 65.09±1.1 years for group 1, and 63.86±1.4 years for group 2 (p=0.134). There was a significant difference between two groups in PSA levels 6.14±0.7 ng/ml, and 11.6±2.2 ng/ml (p=0.001), as well as insulin levels in 2-hour plasma samples 81.9±12 µIU/ml and 57.4±17.2 µIU/ml (p=0.033) in groups 1 and 2, respectively. The mean insulin level in group 2 was significantly lower than that of Group 1. The comparison of two groups is presented in Table 1.

One-hour and 2-hour plasma insulin levels after OGTT were found to be significantly higher than fasting levels as usual. There was only a significant difference after OGTT in IGFBP-3 levels for group 1. IGFBP-3 levels after OGTT were 4725.9±504,4 ng/ml and 3929.4±346.5 ng/ml for 1 hour and 2 hours, respectively and this was significantly lower

Table 1— Comparison of The Two Groups.

	BPH (n=45)	PCA (n=39)	p
PSA	6.14±0.7	11.6±2.2	0.001
Insulin (0 time)	12.7±1.1	17.6±7	0.301
Insulin (1 hour)	95.9±12.4	86.9±18.3	0.542
Insulin (2 hours)	81.9±12	57.4±17.2	0.033
IGF-1 (0 time)	215.3±14.7	203.4±19.7	0.319
IGF-1 (1 hour)	233.2±17.7	214.3±21.5	0.277
IGF-1 (2 hour)	210.6±20.1	198.8±22.1	0.801
IGFBP-3 (0 time)	4064.9±353.1	4460.7±466.6	0.608
IGFBP-3 (1 hour)	4725.9±504.4	3880.5±436	0.184
IGFBP-3 (2 hours)	3929.4±346.5	4084.7±4.9.8	0.686

(p=0.046). There was not a significant difference both before and after the OGTT in IGF-1 serum levels.

Discussion

Prostate cancer is the most common form of non-cutaneous cancer in elderly men and insulin-like growth factors (IGFs) have been proposed as important growth factors in the development of this tumor and its progression to androgen independence (1,13). The IGF network is composed of two peptid growth factors (IGFI-II), two transmembrane receptors (type I and II), IGF binding proteins (IGFBPs) number of which are yet unclear, and IGFBP proteases (PSA, cathepsin D) (9,14).

The IGF ligands are structurally similar and share a 70% homology with each other and 40% homology with pro-insulin. IGF-1 is mainly bound to IGFBP-3 and the principal functions of the IGFBPs are the transport and modulation of IGFs and their activities (11). IGFBP-3 is mainly known as an inhibitor of IGF-1, however, it has been demonstrated to both prevent cell growth and induce apoptosis by way of novel pathway independent of either p 53 or the IGF/IGF receptor-mediated systems (14). IGFs exert an acute anabolic action on protein and carbohydrate metabolisms and regulate cell proliferation, differentiation and apoptosis. IGF is required for the normal growth cell and development of the prostate gland. In vitro, it has been shown to stimulate androgen receptors in the prostate cancer cells, resulting in PSA production (15).

Chan at al. examined serum IGF-1 levels in patients who later went on to develop prostate cancer. They found that those with higher IGF-1 levels were at greater risk of later being diagnosed as having prostate cancer than those with lower IGF-1 levels (6). The study by Wolk et al. demonstrated an association between the serum levels of IGF-1 and the risk of prostate cancer (16). These studies showed that there was a two- to threefold increase in the risk of cancers when serum IGF-1 was in the higher quartiles. Chan et al. proposed a protective effect of increased serum IGFBP-3 levels, a finding which was not supported by Wolk et al. Recently, in another study, high levels of IGF-1 were found to elevate the risk of prostate cancer (17). In our study, there was not a significant difference either before or after OGTT in IGF-1 levels between groups. Our results were similar with that published by Latif and Cutting's study (12,18). The only significant difference after OGTT was in the IGFBP-3 levels in group 1. IGFBP-3 levels were not decreased in group 2. This result didn't support the idea that IGFBP-3 has a protective role against to prostate cancer, but the correlation was not strong. Tricoli et al. demonstrated that African Americans, who have the highest incidence of prostate cancer, did not have elevated serum IGF-1 levels but instead had lower IGFBP-3 levels. They concluded that the IGF-1/IGFBP-3 ratio, which is higher in African Americans, high-risk people for the developing prostate cancer, may be more significant (19). Kurek et al. found no association between IGF-1 and prostate cancer as well (20). Hazem et al. didn't determine IGF-1 and IGFBP-3 as tumor markers, in a similar study without using OGTT (21). Finally, we did not find a strong correlation between Pca and the IGF axis, like many authors. Studies on the IGF axis and nuclear polymorphism are being compromised due to a lack of relationship between cancer and the IGF axis (10,14).

Normal glucose homeostasis is characterized by appropriate insulin secretion and low HbA1c (10). Higher insulin le-



vels are associated with increased risk of prostate cancer. Moreover, prostate cancer cells need insulin for their growth in the culture (22). One large epidemiologic study proposed an equivocal relationship between diabetes mellitus and Pca. Association of diabetes mellitus with Pca was explored during a 13-year follow up among men. After adjustment for factors associated with prostate cancer in previous studies, little association was found between diabetes mellitus at baseline and prostate cancer incidence (23). Sara et al. suggest that abdominal obesity and increasing serum insulin levels are associated with a higher risk of BPH (24). However, the European Prospective Investigation into Cancer and Nutrition (EPIC) proposed that there was an inverse association between self-reported diabetes mellitus and subsequent risk of prostate cancer recently (25).

In our study, insulin serum levels after OGTT were higher than their basal levels; however, there was no significant difference between 1-hour and 2-hour insulin serum levels. Late plasma insulin levels "2 hour samples after OGTT) were found to be significantly lower in patients with prostate cancer compared to BPH patients (p=0.033), compatible with the literature.

In conclusion, insulin, IGF-1 and IGFBP-3 remain far away as being defined as tumor markers for prostate cancer since findings are still inconclusive and unclear. Future studies on the IGF axis and its genetics are obviously needed to understand if these substances play any role of in the development of prostate cancer.

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Onur TURAN
Can SEVİNÇ

RESEARCH

HOME NON-INVASIVE MECHANICAL VENTILATION THERAPY IN ELDERLY COPD PATIENTS

ABSTRACT

Introduction: Home non-invasive mechanical ventilation has been widely used in recent years as a treatment for chronic obstructive pulmonary disease in patients with chronic hypercapnic respiratory failure. We aimed to evaluate the use of home mechanical ventilation therapy in elderly patients.

Materials and Method: Chronic obstructive pulmonary disease patients with hypercapnic respiratory failure using home mechanical ventilation over age 65 were investigated cross-sectionally in Dokuz Eylul University Hospital between 2009-2011.

Results: The 31 patients (23 male and 8 female) had a mean age of 66.2±11.1.The most common application symptom was dyspnea; symptoms were found to regress in 63.4% of the group according to the Borg scale. Patients used mechanical ventilation for an average time of 4.6±3.9 h/day. 24 patients (77.4%) reported no problems with vehicle adherence. It was found that pH increased from 7.37 to 7.40 (p=0.07) and PaCO2 decreased from 64.3 mmHg to 50.1 mmHg (p<0.001) in a statistically significant way in arterial blood gas after mechanical ventilation therapy. Mean FEV1 value increased from 0.76 L to 0.80 L (% predicted from 31.6% to 32.2%).Emergency visits decreased from 1.6/year to 0.9/year, and a 1.3/year hospitalization rate decreased to 0.7/year after home mechanical ventilation therapy, both of which were statistically significant (p=0.044 and p=0.003, respectively).

Conclusion: Elderly chronic obstructive pulmonary disease patients on a home mechanical ventilation program were found to have good treatment adherence, reduction in dyspnea, decrease in acidosis and hypercapnia, functional improvement, and a lower number of emergency visits and hospitalizations. These results show that home mechanical ventilation treatment can provide medical benefits.

Key Words: Pulmonary Disease; Chronic Obstructive; Aged; Respiration, Artificial

ARAŞTIRMA

YAŞLI KOAH HASTALARINDA EVDE NON-İNVAZİV MEKANİK VENTİLASYON TEDAVİSİ

ÖZ

Giriş: Kronik obstruktif akciğer hastalığında kronik solunum yetmezliğinin tedavisinde evde non-invaziv mekanik ventilasyon tedavisi, son yıllarda kullanımı giderek artan önemli bir tedavi açılımıdır. Yaşlı kronik obstruktif akciğer hastalığı olanlarda ev mekanik ventilasyon tedavisi etkinliğinin değerlendirilmesi amaçlandı.

Gereç ve Yöntem: Bu çalışmada,2009-2011 yılları arasında Dokuz Eylül Üniversitesi Hastanesi'nde görülen ve kronik obstruktif akciğer hastalığına bağlı hiperkapnik solunum yetmezliği nedeniyle evde mekanik ventilasyon tedavisi düzenlediğimiz 65 yaş üstü 31 hasta kesitsel olarak incelendi.

Bulgular: Yirmi üç erkek (%74,2), 8 kadın (%25,8) toplam 31 olgunun yaş ortalaması 66,2±11,1 idi. En sık görülen semptom (tedavi öncesi) olan dispne, non-invaziv mekanik ventilasyon tedavisi sonrasında Borg skalasına göre %63,4 hastada azalmıştı. Günde ortalama cihaz kullanım süresi 4,6±3,9 saat idi. Olguların 24'ü (%77,4) tedaviye uyum sağlamakta sorun yaşamadıklarını belirtti.Tedavi öncesi ve sonrası arter kan gazı analizlerinde; pH'da 7,37'den 7,40'a yükselme (p=0,07) ve PaCO2'de 64.3 mm Hg'dan 50.1 mmHg'ya düşme (p<0,001) anlamlı olarak bulundu. Ortalama FEV1 değerinin, tedavi ile 0.76 L'den 0.80 L'ye (% beklenen: % 31.6'dan % 32.2'ye) yükseldiği gözlendi. Acil servis başvurularının evde mekanik ventilasyon tedavisi sonrası 1.6/yıl'dan 0.9/yıla, kronik obstruktif akciğer hastalığı ve solunum yetmezliğine bağlı hastaneye yatış sıklığının 1.3/yıl'dan 0.7/yıla, anlamlı olarak gerilediği belirlendi (p=0.044 ve p=0.003).

Sonuç: Yaşlı kronik obstruktif akciğer hastalığı olanlarda evde mekanik ventilasyon tedavisine hasta uyumunun iyi olduğu, dispnenin azaldığı, asidoz ve hiperkapnide düzelme olduğu, düzeylerinin gerilediği, fonksiyonel düzelme sağlandığı, acil servis başvurularının ve hastaneye yatış sıklığının azaldığı görülmüştür. Sonuç olarak, yaşlı evde non-invaziv mekanik ventilasyon tedavisiyle önemli medikal kazanımlar sağlanmaktadır.

Anahtar Sözcükler: Mekanik Ventilasyon Uyumu; Kronik Hiperkapnik Solunum Yetmezliği; Kronik Obstruktif Akciğer Hastalığı; Yaşlı Hastalar; Evde Non-invaziv Mekanik Ventilasyon.

Correspondance

Onur TURAN
Dokuz Eylul University, Faculty of Medicine,
Department of Chest Diseases İZMİR

Phone: 0505 525 28 43
e-mail: onurtura@yahoo.com

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Accepted: 25/12/2014

Dokuz Eylul University, Faculty of Medicine,
Department of Chest Diseases İZMİR

Introduction

Chronic obstructive pulmonary disease (COPD) is a major health problem with high mortality and morbidity rates, despite medical and surgical therapies and long-term oxygen therapy (1). Several retrospective reports have demonstrated the efficacy of non-invasive mechanical ventilation (NIMV) in acute (2) and chronic respiratory failure (3). The use of NIMV in acute respiratory failure due to COPD exacerbation reduces the need for intubation, the length of hospitalization, and mortality, which is very important for COPD patients (2). However, the evidence on the use of NIMV in severe and stable COPD patients is inconsistent (4).

Dysfunction of the respiratory muscles, especially the diaphragm, is an important problem that occurs in patients with COPD. NIMV may improve respiratory muscle function by providing a rest for chronically tired respiratory muscles in COPD patients (5).

NIMV provides aeration of the lungs with positive airway pressure by increasing transpulmonary pressure. Airflow obstruction leads to expiratory flow limitation and an increase in airway resistance. Hyperinflation exists with the increasing end-expiratory lung volume due to an airflow limitation (6). NIMV also has great benefits in COPD by decreasing airway resistance, end-expiratory lung volume and the level of dynamic hyperinflation (7).

Home non-invasive mechanical ventilation (NIMV) has been widely used in recent years for the treatment of COPD patients with chronic hypercapnic respiratory failure. NIMV has been reported to have a positive impact on the number of hospitalizations (8) and quality of life of COPD patients (9). Home NIMV was also showed to be effective at minimising costs in COPD treatment (10). Nowadays, thousands of people in the world use home bi-level positive airway pressure (BiPAP) treatment. In the Eurovent study, which included 16 European countries, the estimated prevalence of patients performing home NIMV was found to be 6.6/100,000 (9).

Chronic obstructive pulmonary disease is a disease generally seen in older patients (11). Elderly COPD patients have a high risk of developing respiratory failure with limited pulmonary reserve, loss of muscle mass and an increased number of other comorbidities.

Although most studies in the literature have demonstrated the positive impacts of home NIMV, some have shown that long term BiPAP therapy has limited positive effects (7). On the other hand, there are only a few studies that specifically focus on home NIMV in an elderly population with COPD. The aim of our study was to demonstrate the effects of home NIMV in elderly COPD patients.

Materials and Method

Thirty-one COPD patients who had been using BiPAP machines at home because of hypercapnic respiratory failure were asked to participate in the study. The patients, who had been followed by the chest diseases department in the Medical Faculty of Dokuz Eylül University, were found using hospital database records from 2009 to 2011. Written informed consent was obtained from all of the patients, and the study was approved by the Ethics Committee of the hospital.

Chronic obstructive pulmonary disease patients who used home NIMV and met the inclusion criteria are described in Table 1. Patients with other diagnoses for alveolar hypoventilation, those who declined to join the study, or those who had a contraindication for the pulmonary function test (PFT) or arterial blood gas (ABG) analysis were excluded. Patients with an exacerbation or hospitalization phase of COPD were evaluated when they became clinically stable. 31 of 45 eligible patients agreed to join the study.

Thirty-one COPD patients aged 65 and older who had been using home BiPAP for a while were invited to our university hospital and were evaluated on the following during a single visit:

- Socio-demographic variables,
- Respiratory symptoms,
- Arterial blood gas analysis,
- Spirometric parameters,
- Questionnaire about home NIMV (ventilator and mask types, all ventilator settings, duration of home NIMV use, average ventilation time per day (hour/day), adherence to the BiPAP machine, etc.)

Table 1— NIMV Indications in COPD.

1. Symptoms (dyspnea, morning headache and general fatigue etc.)
AND
2. Physiological criteria
a. $PaCO_2$ >55 mmHg
OR
b. $PaCO_2$ 50-54 mmHg with:
Nocturnal oxygen desaturation:
O_2 saturation: <88% for 5 minutes with min. 2 L/min O_2 therapy
OR
Hospitalization min. two times/year with hypercapnic respiratory failure



- Number of emergency admissions and hospitalizations (including the periods of one year before and after home BiPAP therapy).

Patients were questioned about changes in their pulmonary symptoms after the beginning of NIMV treatment; the increases, decreases or stable position of the symptoms were recorded. Dyspnea was assessed using the Borg scale (12).

All patients underwent the standard spirometry used at our university hospital, a Vmax 22 system (Sensor Medics Pulmonary Function Analysis Instrument) following the guidelines of the American Thoracic Society (13). Flow was measured at the mouth through a mass flow sensor, and volume was obtained by numerical integration of the flow signal. Forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC) and forced expiratory volume during the first second/forced vital capacity (FEV1/FVC) were evaluated. These values were calculated from three reproducible maximal forced expiratory maneuvers. In patients with FEV1/FVC lower than 70%; FEV1 over 80% represents mild, between 50-79% represents moderate, 30-49% represents severe and lower than 30% represents very severe COPD, according to the GOLD criteria (14).

Arterial blood gas analysis for blood obtained from the radial artery was performed at rest and in a sitting position. ABG was measured at least 30 minutes after the withdrawal of oxygen or BiPAP usage.

Ventilator and mask types, and all ventilator settings including inspiratory positive airway pressure (IPAP) and expiratory positive airway pressure (EPAP) values were recorded. The total duration of home use of NIMV (determined from the mechanical ventilation device counter), average ventilation time per day (hours/day), and adherence to the BiPAP machine were investigated. Patients learned that if they had a problem with the ventilator, they could receive technical support. We also recorded all hospital and emergency department admissions, including hospitalizations one year before and after the use of home NIMV.

The values of PFT and ABG, and emergency admissions and hospitalizations because of COPD exacerbation or respiratory failure before and after BiPAP treatment were compared. The initial values of PFT and ABG, according to reports given to COPD patients using home NIMV, were used in this comparison; they were known to be the last parameters of PFT and ABG before they started to use home BiPAP (pre-BiPAP data). We ensured that patients' initial data belonged to a clinically stable period of COPD without any exacerbation. Every visit for each patient for the evaluation of home NIMV therapy and monitoring of ABG and PFT was also made during a stable period of COPD. ABG analysis was performed without oxygen.

The differences between the initial and new parameters of patients were evaluated by t-tests for dependent groups, and by paired-samples t-tests for nonparametric data. All data were analyzed using SPSS.

RESULTS

Thirty-one patients with a mean age of 66.2 11.1, including 23 males and 8 females, participated in the study.

Our sample included 5 (16.1%) moderate (these patients with respiratory acidosis had started to use home NIMV), 9 (29%) severe and 17 (54.9%) very severe COPD patients, according to COPD classification criteria (14). The most common comorbid disease was hypertension (54.8%).

Patients been diagnosed with COPD for an average of 8.97±4.72 years. The average duration of BiPAP machine use was 16.6 months. Chronic obstructive pulmonary disease patients had started using home BiPAP therapy 7.60±4.73 years after diagnosis. Patients used NIMV an average of 4.6 h/day. Average EPAP and IPAP values were 5.4±1.5 cm F H_20 (min. 4, max. 11) and 11.4±2.1 cm H_20 (min. 8, max. 16), respectively.

Twenty-seven COPD patients (87.1%) were also on long-term oxygen therapy (LTOT), while 14 patients were also using home nebulizers (45.2%).

Twenty-four patients (77.4%) reported no problems with BiPAP adherence. Twelve patients (38.7%) were having trouble with NIMV; inadaptability to the BiPAP machine was the most frequent problem (Figure 1).

Technical service for the BiPAP machines was supplied to 25.8% of patients, while 63.6% reported problems in getting help with their BiPAP machines.

Seventeen (54.8%) patients used nasal and 14 (45.2%) used oronasal masks. Only five patients (16.1%) reported trouble with the BiPAP masks.

Dyspnea was found to be the most common symptom (74.2%) in our study patients; the other symptoms were cough (45.2%) and sputum (29%).

Symptoms were said to regress in 20 (64.5%), increase in 4 (12.9%) and remain unchanged in 7 (22.6%) study patients after they used home NIMV. The Borg scale point, which had a mean of 5.0 ± 2.5 before home NIMV, decreased to 3.6±2.9 after therapy; this difference was statistically significant (p=0.001).

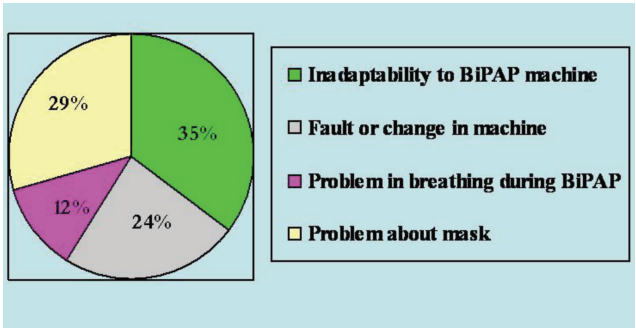


Figure 1— Problems about BiPAP adherence.

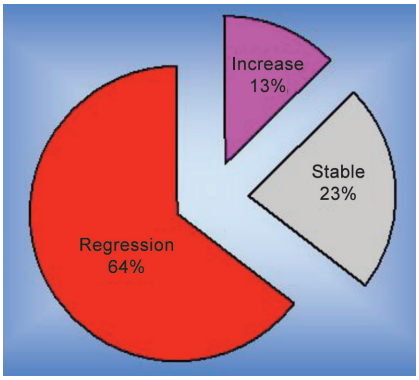


Figure 2— Comparison of ABG parameters before and after home BiPAP therapy.

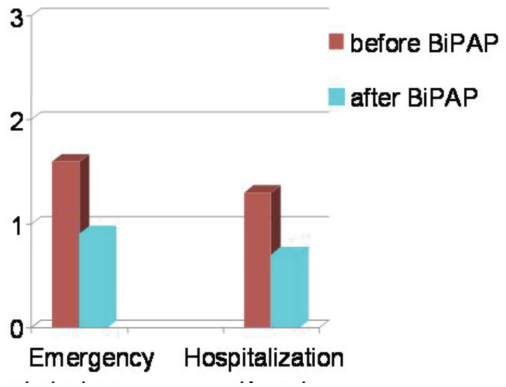


Figure 3— Emergency admissions and hospitalizations before and after home NIMV.

Arterial blood gas analysis before and after NIMV were compared (Table 2); it was found that pH increased from 7.37 to 7.40, $PaCO_2$ value decreased from 64.3 ± 8.3 mmHg to 50.1±7.2 mmHg (which was statistically significant; p=0.001), and average PaO_2 value increased from 63.9±18.4 mmHg to 69.1±15.2 mmHg (p=0.292) (Figure 2).

Spirometric parameters before and after home BiPAP therapy were also compared. Mean FEV1 value increased from 0.76 L to 0.80 L (% predicted from 31.6% to 32.2%) after the use of home NIMV. Average FEV1/FVC value increased from 53.3% to 55.3% (p=0.230).

Emergency visits decreased significantly from 1.6/year to 0.9/year with the use of home NIMV (p=0.047); in addition, the 1.3/year hospitalization rate (because of COPD exacerbation or respiratory failure) became 0.7/year after home BiPAP therapy, which was statistically significant (p=0.013) (Figure 3).

Discussion

NIMV is generally known to be an effective treatment for COPD patients with acute hypercarbic respiratory failure. NIMV may decrease the need for invasive mechanical ventilation in these patients (15). It was demonstrated that selected populations of chronic hypercapnic COPD patients may show clinical and physiologic responses with home NIMV (16). So, NIMV is also a promising method of treatment for COPD patients with chronic respiratory failure as a home ventilatory support.

To our knowledge, pulmonary symptoms, especially dyspnea, have been found to regress after the use of home NIMV

Table 2— ABG and Spirometric Parameters Before and After Home NIMV Treatment.

ABG and Spirometric Parameters	Before Home NIMV Treatment	After Home NIMV Treatment	p
$Pa0_2$, mm Hg	63.9±18.4	69.1±15.2	0.292
PaCO2, mm Hg	64.3±8.3	50.1±7.2	**0.001**
pH	7.37±0.08	7.40±0.04	0.070
FEV_1, L	0.76±0.3	0.80±0.3	0.939
FEV_1, %	31.6±12.5	32.2±14.3	0.863
FEV_1 / FVC, %	53.3±9.9	55.3±12.4	0.220



in most patients. Renston et al. demonstrated a low dyspnea score with home NIMV therapy (17). There have been some reports showing an improvement in maximal inspiratory pressure (MIP) and electromyographic activity of the diaphragm (18), which support our results of improvement in dyspnea.

The results of our study showed a positive impact on ABG levels with home BiPAP treatment. Meecham Jones et al. found significant improvements in daytime gas exchange compared with baseline ABG values in their NIMV group (19). They also suggested that patients with near normocapnia received less benefit from home NIMV treatment. The reason for this result was defined as a compensation mechanism for nocturnal hypoventilation in hypercapnic patients who responded better to nocturnal ventilation (19).

Spirometric parameters such as FEV1 value increased after the use of home NIMV in our study. Most of the previous studies reported no change in pulmonary functions after home BiPAP therapy (19). It is thought that the improvement in respiratory muscle function after NIMV therapy may be the reason for the increase in FEV1 value.

Our study demonstrated a 50% reduction in the event rate of emergency admissions after home NIMV treatment, which seems to be a remarkable result. As the rising morbidity and mortality from COPD is coupled with increasing rates of emergency admissions, the reduction in emergency visits may indicate an improvement in the life expectancy of COPD patients.

There was a reduction in the number of hospitalizations for exacerbations and respiratory failure in COPD patients after home NIMV therapy. Some studies demonstrated that there had been a reduction in the number of hospitalizations one year after home NIMV (20). The length of time COPD patients spent in hospital because of cardiac or respiratory illness may decrease after NIMV therapy. Studies on home NIMV treatment have reported an increase in quality of life with the reduction of hospitalizations (8). The cost-effectiveness of home BiPAP treatment has also been shown, related to a significant reduction in the number of hospitalizations (10). Although there are some reports showing that NIMV had no effect on exacerbations or hospital admissions after 1 year (8), with studies showing positive results in the majority, it is suggested that home NIMV therapy may be useful for COPD patients by decreasing the rate of hospitalization.

Adherence to the BiPAP machine is another important parameter for evaluating home NIMV therapy in COPD patients; patient–ventilator dyssynchrony may be a cause of suboptimal ventilation. In our study, nearly three-fourths of the patients reported no adherence problems in using home NIMV. Most patients were reported to tolerate home mechanical ventilation reasonably well in a study by Chu et al (21). It has been reported that NIMV is effective if it is set on the basis of patient comfort, with a synchrony with the patient's respiratory muscle effort and mechanics (22). We found the most frequent problem in using home NIMV was inadaptability to the BiPAP machine. We suggest that COPD patients may have more benefits from long-time NIMV therapy if clinicians observe and evaluate their adherences to home ventilators before and during NIMV treatment.

Some technical problems might cause a temporary suspension of mechanical ventilation. Karakurt et al. showed that even a brief withdrawal of NIMV in patients with chronic hypercapnic respiratory failure may lead to worsening of ABG levels and symptoms (23). Therefore, technical support and solving problems with BiPAP machines are important for COPD patients with home NIMV.

The average BiPAP usage time was found to be 4.6 hours per day in our study. It has been reported that COPD patients with chronic respiratory failure require mechanical ventilation for over 12 hours per day (23), which is much longer than our results show. We suggest that patients should be asked about their daily usage time of home NIMV for the ideal management of mechanical ventilation.

Regression in mortality rate is an important endpoint that demonstrates the success of home NIMV treatment for COPD patients. Although there is no conclusive evidence that home BiPAP treatment increases survival in COPD patients, there are hopeful studies on this subject (10). It was observed that the mean survival time in the group receiving domiciliary NIMV was significantly higher than that of the group not receiving NIMV in a study (24). Follow-up of COPD patients with home NIMV in a prospective study may contribute to our understanding of the effect of this treatment on survival rates.

Although most of the studies have shown the feasibility of home NIMV in COPD patients, some studies revealed different results. Casanova et al. (7) showed that long term NIMV had no effect on exacerbations or hospital admissions. Therefore, our study had important results that demonstrated the positive impacts of home NIMV with COPD patients. Despite the many studies on the use of home NIMV, its use with a specifically selected elderly population with COPD has rarely been studied. Balami et al. specified that elderly patients may gain similar benefits from NIMV as do younger patients with

COPD, who have a high rate of treatment success (25). Our study is one of only a few studies to examine home NIMV in elderly COPD patients.

There are some limitations of our present study. The first is the small number of elderly COPD patients with home NIMV. Our cross-sectional study design may be the reason for this. Lack of a control group is also a limitation of our study. Another limitation is the subjective reporting of the parameters of pulmonary symptoms and patient adherence to the mechanic ventilator. These data depended on the comments of the patients. An objective method for collecting these data may increase the reliability of the study. Further, larger studies of home NIMV in elderly COPD patients are required to confirm our results.

In conclusion, COPD patients on a home mechanical ventilation program were found to have a good treatment adherence, reduction in dyspnea, decrease in acidosis and hypercapnia, functional improvement, and a decrease in emergency visits and hospitalization. It is suggested that home NIMV is a promising therapeutic modality for management of chronic hypercapnic COPD patients, with medical and economic benefits. Home NIMV is as well tolerated and as successful in an older as in a younger population of COPD patients with chronic hypercapnic failure.

Conflict of Interest

No potential conflicts of interest are disclosed.

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Kayıhan PALA
Harika GERÇEK
Alpaslan TÜRKKAN

RESEARCH

THE EFFECT OF HOUSE VISITS ON HYPERTENSION CONTROL IN THE ELDERLY: A STUDY FROM BURSA, TURKEY

ABSTRACT

Introduction: The aim of this study was to evaluate the effect of house visits on hypertension control in the elderly.

Materials and Method: In Bursa, the Nilüfer Public Health Training and Research Area conducts a follow-up program for the elderly. Nurses and midwives visit people over 65 years of age every six months, which is a new practice in Turkey. During these visits, they measure blood pressure and ask questions about their patients' health conditions. If the patients' blood pressure is high then they are referred to a physician. In that case, the patients are also re-visited by the nurse or midwife the following month to check whether they consulted a physician and to observe the current condition of the patients' health. Follow-up cards of elderly patients were analysed. People who were visited regularly every six months and who had four blood pressure measurements (1063 women and 713 men) were included.

Results: The prevalence of women with normal blood pressure (normal, prehypertension or controlled) was 34.5% at the first visit and it increased to 46.4% at the fourth visit ($p<0.05$). For men, the corresponding percentages were 41.4% and 54.4%, respectively ($p<0.05$).

Conclusion: In this study, there was a positive effect of house visits by public health nurses and midwives on hypertension management in the elderly.

Key Words: Hypertension; Aged; Midwifery; Turkey.

ARAŞTIRMA

YAŞLILARDA HİPERTANSİYON KONTROLÜNDE EV ZİYARETLERİNİN ETKİSİ: TÜRKİYE, BURSA'DAN BİR ÇALIŞMA

ÖZ

Giriş: Bu çalışmanın amacı yaşlılardaki hipertansiyonun kontrolünde ev ziyaretlerinin etkisini değerlendirmektir.

Gereç ve Yöntem: Bursa'da, Nilüfer Halk Sağlığı Eğitim ve Araştırma Bölgesi'nde yaşlılar için bir izlem programı yürütülmektedir. Türkiye için yeni olan bu uygulamada, hemşire ve ebeler, 65 yaş ve üzerindeki kişileri altı ayda bir ziyaret etmektedir. Bu ziyaretler sırasında, onlar yaşlı kişilerin kan basınçlarını ölçmekte ve sağlık durumları ile ilgili sorular sormaktadır. Hastanın kan basıncı yüksek ise doktora yönlendirilmektedir. Uygulamada, doktora gidip gitmediklerini kontrol etmek ve son sağlık durumlarını gözlemlemek amacıyla hastalar takip eden ay içinde ebe-hemşire tarafından tekrar ziyaret edilmektedir. Bu çalışmada yaşlı takip kartları incelenmiştir. Altı ayda bir düzenli takip edilen ve dört kan basıncı ölçüm sonucu var olan kişiler (1063 kadın ve 713 erkek) çalışmaya alınmıştır.

Bulgular: İlk ziyarette kan basıncı değerleri normal olan (normal, prehipertansiyon ya da kontrol altında) kadınların oranı %34,5 iken bu değer dördüncü ziyarette %46,4'e çıkmıştır ($p<0,05$). Erkekler için ise bu oranlar sırasıyla %41,4 ve %54,4'tür ($p<0,05$).

Sonuç: Bu çalışmada, ebe-hemşireler tarafından yaşlılara yapılan ev ziyaretlerinin hipertansiyonun kontrolünde olumlu bir etkisi olduğu saptanmıştır.

Anahtar Szcükler: Hipertansiyon; Yaşlı; Ebe; Türkiye.

Correspondance

Alpaslan TÜRKKAN
Uludağ University, Faculty of Medicine, Department of Public Health, BURSA

Phone: 0224 295 42 81
e-mail: alpaslanturkkan@gmail.com

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Uludağ University, Faculty of Medicine, Department of Public Health, BURSA

INTRODUCTION

The world's population is gradually aging. In developing countries, this trend increases the importance of health services for the prevention, early diagnosis and therapy of chronic diseases in the elderly.

Hypertension (HT) is an increasingly important medical and public health issue. The prevalence of hypertension increases with age; in fact, more than half of people 60-69 years of age and three-fourths of those 70 years of age and over are affected (1).

The ultimate public health goal of hypertension therapy is to reduce cardiovascular and renal disease morbidity and mortality. Treating patients so that systolic blood pressure (SBP) and diastolic blood pressure (DBP) levels are <140/90 mmHg is associated with a decrease in cardiovascular disease complications (2).

Lifestyle modification, pharmacologic treatment, individual blood pressure control and follow-up are important components of hypertension therapy (3).

Hypertension prevalence among the elderly is very high in Turkey, as in many other regions of the world. For example, in Gemlik District, hypertension prevalence was 58.0% and 64.3% among the 60-69 and 70-79 age groups, respectively (4).

Although hypertension among the elderly is a major public health issue, there is no early diagnosis and control program in Turkey. A follow-up program for the elderly is being implemented since 2003 in Bursa, the Nilüfer Public Health Training and Research Area (NPHTRA). According to this program, public health nurse and midwives visit elderly people every six months at their home regularly.

The aim of this study was to evaluate the effect of house visits on hypertension control in the elderly.

METHODS

This cross-sectional study was conducted in the NPHTRA in Bursa, Turkey. The NPHTRA was founded in 2001 by Uludağ University and the Municipality of Nilüfer.

The main philosophy of the NPHTRA is to provide services to people who consult a health worker by visiting people at home, at school and, when necessary, at their workplace. Public health nurses and midwives visit people over 65 years of age every six months at home regularly. During these visits, they measure blood pressure and glucose levels of people and evaluate their health conditions. If the peoples' blood pressure and/or glucose levels are high or they have other health problems, then they are referred to a physician. In that case, the patients are also re-visited by the nurse or midwife the following month to check whether they consulted a physician and to observe the current condition of the patients' health.

From 2003 until to 2014, follow-up cards for elderly were analysed using data from the previous years. People who were regularly visited every six months and who had four blood pressure measurements were included in the study.

Blood pressure was measured using a standard mercury sphygmomanometer. Blood pressure categories were classified in accordance with the guidelines of the Seventh Report of the Joint National Committee (JNC 7) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure as follows: "normal" (<120/80 mmHg), "prehypertension" (120/80–139/89 mmHg), "stage 1" (140–159/90–99 mmHg) or "stage 2" (?160 / 100 mmHg) hypertension (3).

Awareness, Treatment and Control of HT

People who reported having HT were classified as follows: aware but not receiving any treatment, aware but with high blood pressure despite receiving treatment and aware and receiving treatment with blood pressure under control.

Awareness of HT was defined by the self-report of any prior diagnosis of HT by a healthcare professional.

Treatment was defined as the use of any antihypertensive medication.

The term "controlled" was defined as having a BP < 140/90 mmHg.

The study was accepted by the Ethical Committee of Uludağ University Faculty of Medicine (Reference No. 2005-7/2).

Data were analysed using the SPSS 20 program. Chi-square, t–test, RM Anova and Cochran's Q tests were used in statistical analyses.

RESULTS

The study included 1063 women (59.9%) and 713 men (40.1%). The mean age of men was 71.2±5.9 and mean age of women was 71.1±6.0 (p>0.05). Table 1 shows some of the characteristics of the study population.

Average values of both SBP and DBP were higher among women than among men for all measurements (p<0.05). Mean SBP level among men differed statistically significant between follow ups (p>0.05). In men, first follow up SBP

Table 1— Some Characteristics of the Study Population (%).

Follow-up	Average SBP mmHg (95% CI)	Average DBP mmHg (95% CI)
Women (n=1063)		
First	144.4 (142.9-145.9)	85.4 (84.6-86.1)
Second	142.6 (141.1-144.0)	83.9 (83.2-84.6)
Third	140.6 (139.2-142.1)	83.0 (82.3-83.8)
Fourth	138.1 (136.7-139.5)	81.8 (81.2-82.5)
p	<0.05	<0.05
Men (n=713)		
First	139.2 (137.5-140.9)	82.9 (82.0-83.8)
Second	137.0 (135.3-138.7)	81.1 (80.2-81.9)
Third	134.9 (133.3-136.5)	79.9 (79.1-80.7)
Fourth	133.1 (131.4-134.7)	79.8 (79.0-80.7)
p	<0.05	<0.05

level were higher than both second and fourth follow up levels (p<0.05); second follow up SBP level were higher both third and fourth follow up levels (p<0.05). Mean DBP level among men differed statistically significant between follow ups (p>0.05). In men, first follow up DBP level were higher than all other follow up levels (p<0.05); second follow up DBP level were higher than third and fourth follow up levels (p<0.05) but there was no statistically significant relationship between third and fourth follow up levels. Mean SBP level among women differed statistically significant between follow ups (p>0.05). In women, first follow up SBP level were higher than both third and fourth follow up levels (p<0.05); second follow up SBP level were higher both third and fourth follow up levels (p<0.05) and third follow up SBP level was higher than fourth follow up level (p<0.05). Mean DBP level among women differed statistically significant between follow ups (p>0.05). In women, first follow up DBP level were higher than all other follow up levels (p<0.05); second follow up DBP level was higher than fourth follow up level (p<0.05) and third follow up DBP level was higher than fourth follow up level (p<0.05). Average SBP and DBP values are shown in Table 2.

The prevalence of women with normal blood pressure (normal, prehypertension or controlled) was 34.5% at the first

Table 2— Average SBP and DBP Values of Participants.

Characteristics		Women	Men	p
Age	65-74	74.7	72.8	>0.05
	75+	25.3	27.2	
Education (years)	≤5	68.6	35.7	<0.05
	>5	31.4	64.3	
Living situation	Alone	16.7	7.3	<0.05
	With spouse	39.9	74.9	
	Other*	43.4	17.8	
Social health insurance	No	23.2	19.6	>0.05
	Yes	76.8	80.4	
The presence of chronic diseases	No	21.3	33.0	<0.05
	Yes	78.7	67.0	
Total	1063 (100.0)	713 (100.0)	1776	

* With his/her children relatives or friends.

Table 3— Blood Pressure Classification of the Participants According to JNC 7 (%).

Follow-up	Normal <120/80mmHg	Pre-hypertension 120/80 -139/89 mmHg	Hypertension Stage 1 140/90-159/99 mmHg	Hypertension Stage 2 ≥160/100 mmHg
Women (n=1063)				
First	74 (7.0)	293 (27.5)	308 (29.0)	388 (36.5)
Second	83 (7.8)	323 (30.4)	331 (31.1)	326 (30.7)
Third	89 (8.4)	350 (32.9)	337 (31.7)	287 (27.0)
Fourth	86 (8.1)	407 (38.3)	346 (32.5)	224 (21.1)
p		<0.05		<0.05
Men (n=713)				
First	82 (11.5)	213 (29.9)	222 (31.1)	196 (27.5)
Second	75 (10.5)	262 (36.8)	222 (31.1)	154 (21.6)
Third	80 (11.2)	284 (39.8)	226 (31.7)	123 (17.3)
Fourth	100 (14.0)	288 (40.4)	212 (29.7)	113 (15.9)
p		<0.05	<0.05	

visit, increasing to 46.4% at the fourth visit (p<0.05). For men, the corresponding percentages were 41.4% and 54.4%, respectively (p<0.05). Hypertension rate in repeated measurements decreased among four follow up both women (p<0.05) and men (p<0.05). The blood pressure classification of the participants, according to the JNC 7 guidelines (3), is shown in Table 3.

At the first visit 629 (74.3%) of women and 288 (57.9%) of men were aware that they had HT. At the second visit, the awareness level increased to over 90% for both men and women (p<0.05).

The prevalence of hypertensive participants who were getting medication increased from 59.7% (first visit) to 68.6% (fourth visit) among women and from 43.7% to 53.3% among men (p<0.05). The proportion of women who received medication was higher than that of men at all visits (p<0.05).

Only 151 of women (17.8%) who reported having HT at the first visit had controlled HT, compared to 324 (38.3%) at the fourth visit (p<0.05). The corresponding percentages were 15.9% (79) and 43.5% (216) among men, respectively (p<0.05).

At the first visit 847 of women (151 of had controlled HT and 696 of had Stage 1 and Stage 2 HT) and 497 of men (79 of had controlled HT and 418 of had Stage 1 and Stage 2 HT) were found that they had HT.

There was no gender difference with respect to having controlled HT at the first visit (p>0.05). At the following visits, however, the ratio of men with controlled HT was higher than the ratio of women (p<0.05). The prevalence of awareness, treatment and control of HT are shown in Table 4.

Having social health insurance did not affect access to medication among men, but women with social health insurance were more likely to obtain medication than women without social health insurance (p<0.05). Using medication rate in repeated measurements increased among four follow up both women who had social health insurance (p<0.05) and men who had social health insurance (p<0.05) and also increased women without social health insurance (p<0.05) and men without social health insurance (p<0.05). The association between having social health insurance and using medication is shown in Table 5.

Discussion

The high prevalence and low awareness and control of HT make it an important public health problem in both developing and developed countries (5). The management of HT is especially poor for older people who have a higher prevalence of HT than their younger counterparts (6).

To help patients successfully change their lifestyles and control their HT, clinicians should collaborate with other health workers. Public health nurses and community outreach workers in high-risk communities are also helpful through their efforts to screen and identify cases, refer and track follow-up appointments and educate patients (3).

In our study, HT prevalence at the first visit was 79.7%

Table 4— Awareness Treatment and Control of Hypertension Among Study Population.

Follow - up	Awareness n (%)	Treatment** n (%)	Control*** n (%)
First	629 (74.3)	506 (59.7)	151 (17.8)
Second	781 (92.2)	531 (62.7)	249 (29.4)
Third	810 (95.6)	563 (66.5)	289 (34.1)
Fourth	820 (96.8)	581 (68.6)	324 (38.3)
p	<0.05	<0.05	<0.05
Men (n=497)			
First	288 (57.9)	217 (43.7)	79 (15.9)
Second	464 (93.4)	246 (49.5)	169 (34.0)
Third	476 (95.8)	260 (52.3)	201 (40.4)
Fourth	481 (96.8)	265 (53.3)	216 (43.5)
p	<0.05	<0.05	<0.05

* Those who are aware that they are hypertensive.
** Those using medication among hypertensive.
***SPB <140 mmHg and DBP <90 mmHg.

Table 5— The Relation Between Having Social Health Insurance and Using Medication.

		Social Health Insurance (%)		
Patients using medication	Follow - up	No	Yes	p
Women	First (n=506)	99 (49.3)	407 (63.0)	<0.05
	Second (n=531)	106 (52.7)	425 (65.8)	<0.05
	Third (n=563)	119 (59.2)	444 (68.7)	<0.05
	Fourth (n=581)	124 (61.7)	457 (70.7)	<0.05
Men	First (n=217)	38 (38.8)	179 (44.9)	>0.05
	Second (n=246)	43 (43.9)	203 (50.9)	>0.05
	Third (n=260)	48 (49.0)	212 (53.1)	>0.05
	Fourth (n=265)	51 (52.0)	214 (53.6)	>0.05

for women and 69.7% for men. These prevalence are higher than those found in studies from Delhi (7) and Thailand (8) and they are similar to findings from China (9), Bangladesh and India (10) and various regions of Turkey (11, 12). They are slightly lower than the results from studies conducted in Trabzon (13) and New York City (14), as well as findings from the Jackson Hearth Study (JHS) (15) and the PatenT study, which represents Turkey in general (16).

Disparities in the prevalence of hypertension among different studies should be assessed together with the methods of study and characteristics of study participants in terms of hypertension risk factors like socioeconomic and racial disparities, being overweight and obese, too much salt intake etc. For example, the age of the participants in Delhi (7) and Thailand (8) studies began 60 years of age instead of 65. Many previous studies have indicated that HT prevalence increases with age and is higher among women (4, 9, 13-15). The high prevalence among older women may be explained by hormonal factors and postmenopausal weight gain.

In this study, HT awareness at the first visit was 74.3% among women and 57.9% among men. These prevalence rates are higher than those found in studies conducted in Delhi (7), Thailand (8) as well as Bangladesh and India (10), and similar to the results from other studies in Turkey (13, 16) and lower than the results from the JHS (15), studies conducted in Balçova (11) and New York City (14). HT aware-



ness levels in our study may be lower than those found in Balçova (11), New York City (14) and the JHS (15) due to the higher development levels of these regions. However, at the second visit, the HT awareness level in our study was found to be higher than those found in the aforementioned studies.

In a New York City study (14), HT awareness was similar for men and women. In contrast, many other studies found that awareness was higher among women than among men (7-10, 15, 16). In previous studies, HT awareness has been found to increase with age, years of education, physician contact in the last year and receiving preventive services (14, 15). In our study, after beginning preventive services, the HT awareness level increased to over 90% for both men and women and the gender difference disappeared.

The main determinant of HT awareness is blood pressure measurement, and there is a strong relationship between the frequency of measurements and HT control (17). Although the percentage of people who never had a blood pressure measurement was below 1.0% in the New York City study (14), the percentages were 25.8% among women and 41.4% among men in Turkey (4). This difference between men and women may help explain the higher awareness among women found in our study. Some people had very infrequent measurements. Of the people who had blood pressure measurements, 14.5% had their last measurement at least two years ago (16). Never having a BP measurement taken or having measurements taken very rarely decreased both HT awareness and control.

In our study, the percentage of people who were getting treatment at the first visit was higher, compared with findings from the Delhi (7), Thailand (8), Bangladesh and India (10) and PatenT (16) studies, but lower than in the New York City study (14) and the JHS (15). Although treatment percentages increased for both men and women during regular visits, they were still lower at the fourth visit than those in the New York City study and the JHS.

Lack of treatment despite HT awareness may be explained by social factors, such as the lack of guidance and knowledge about the risks of HT or financial hardship (9).

In our study, as in many other studies, the percentage of women who received treatment was higher than that of men (7, 9,10,13,15,16). Preventive services increase the probability of treatment (15). We found that preventive services led to an increase in treatment for both genders, but the discrepancy between men and women remained.

The prevalence of controlled HT at the first visit in our study was lower than the corresponding prevalence in the New York City study (14) and the JHS (15), but higher than the prevalence found in the Trabzon (13) and Bangladesh and India (10) studies. Our results were similar to those of the Delhi (7) and PatenT (16) studies. The prevalence of controlled HT was higher at the fourth visit, but it was still lower than in the JHS.

The controlled HT is closely related with raising awareness and getting treatment. Both awareness and treatment rates were higher than our study in the New York City study (14) and JHS (15).

At the first visit, there was no gender difference in having controlled HT, which is consistent with the findings of the Thailand (8), Bangladesh (10) and New York City (14) studies. At the follow-up visits, the percentage of controlled HT was higher among men. Although the treatment of HT was higher among women in our study, HT control was lower. This might be explained by the higher rate of lifestyle change among men versus women.

Continuing preventive services increased the prevalence of HT awareness to that of developed countries. Although the prevalence of HT treatment and control also increased during the survey, they were below those found in developed countries. This might be due to the fact that HT treatment and control are related to socioeconomic factors. Lifestyle change and access to health care are important factors for BP control in the elderly (14,17). The present study found that hypertensive people who visited the same health care facility or had the same health care provider had 2- to 5-fold higher odds of controlling their hypertension. Access to high-quality healthcare is considered the most important factor for HT control (17). Uncontrolled HT might indicate limited access to care or a low quality of care (8).

HT prevalence is not related to social health insurance (11); however, people without social health insurance might have fewer BP measurements and physician visits. Additionally, they might not seek healthcare until they are seriously ill. Social health insurance and having a routine source of care has been found to increase access to preventive care (18). Awareness, treatment and control of HT are lower among people without social health insurance and a routine place of care (14,17,19-21). Not having social health insurance is related to the use of antihypertensive and it is one of the main determinants of medication use. Uninsured patients have higher BP, independent of age or known physiologic and socioeconomic factors (22). Lack of insurance is an independent risk factor for BP control in young and middle-aged people (23) and it is also a barrier to care (24). In our study, ther-

apy was higher among women with social health insurance, but there was no difference among men with or without social health insurance. Between the first and fourth visits, medical therapy increased for both men and women, independent of having social health insurance.

In this public health program, midwives visit elderly people every six months. It is recommended that patients should be followed up every 2-4 weeks until medicine titration is regulated. Patients with low cardiovascular disease risk and mild HT should be followed up every 6 months (25).

There were some limitations of our study; firstly we could not evaluate HT risk factors, such as body mass index or smoking, as there were no data for these factors in our records; secondly the details of the procedures used for HT detection (place of referral, laboratory findings) and medical treatment (medication, dosage) were not recorded.

In conclusion, home visits by public health workers had a positive effect on HT management in the elderly, regardless of the subject's risk situation.

Conflict of Interest

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

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Emrah TÖZ[1]
Sefa KURT[2]
Mehmet Tunç CANDA[3]
Çağdaş ŞAHİN[1]
İbrahim Egemen ERTAŞ[1]

RESEARCH

ASSOCIATION BETWEEN STAGE 2 OR HIGHER PELVIC ORGAN PROLAPSE AND BONE MINERAL DENSITY IN POSTMENOPAUSAL WOMEN

ABSTRACT

Introduction: Because of the similarities in the pathophysiology of pelvic organ prolapse and osteopenia, we aimed to investigate the existence of a relationship between stage 2 or higher pelvic organ prolapse and bone mineral density.

Materials and Method: The hospital database between July 2011 and July 2012 was searched for women who underwent surgery for stage 2 or higher pelvic organ prolapse (study group). An additional search was conducted for women who underwent surgery for other benign gynaecological indications with stage 0 or stage 1 pelvic organ prolapse (control group).In total, 1652 women aged 40–68 years with adequate medical data were identified. Two hundred and sixteen patients with stage 0 or stage 1 pelvic organ prolapse and stage 2 or higher pelvic organ prolapse were compared in terms of bone mineral density.

Results: The difference between the two groups was not statistically significant for osteoporosis (p=0.347) but osteopenia was significantly more prevalent in the study group compared with the control group (p=0.012). In addition, women with stage 2 or higher pelvic organ prolapse had significantly lower femoral trochanteric and lumbar spine T and Z scores than those with absent prolapse.

Conclusion: This study found that the prevalence of osteopenia was higher among women with stage 2 or higher pelvic organ prolapse compared with those with stage 0 or stage 1 pelvic organ prolapse. In particular, the presence of stage 2 or higher rectocele or cystorectocele was associated with an increased risk of osteopenia.

Key Words: Pelvic Organ Prolapse; Osteoporosis; Bone Density; Osteopenia.

ARAŞTIRMA

POSTMENAPOZAL DÖNEMDEKİ KADINLARDA 2. DERECE VE ÜSTÜ PELVİK ORGAN PROLAPSUSU İLE KEMİK MİNERAL YOĞUNLUĞU ARASINDAKİ İLİŞKİ

ÖZ

Giriş: Bu çalışmanın amacı pelvik organ prolapsusu ve osteopeni patofizyolojisindeki benzerlikler nedeniyle 2. derece ve üstü pelvik organ prolapsusu ile kemik mineral yoğunluğu arasındaki ilişkiyi araştırmaktır.

Gereç ve Yöntem: İkinci derece ve üstü pelvik organ prolapsusu nedeniyle Temmuz 2011-Temmuz 2012 tarihleri arasında opere olan hastaların kayıtları incelenmiştir (çalışma grubu). Sıfır ve 1. derece pelvik organ prolapsusu olan ve diğer benign nedenlerle opere olan hastaların kayıtları da incelenmiştir (kontrol grubu). Düzenli kayıtları olan 40-68 yaş arasında 1652 hasta saptanmıştır. Sıfır ve 1. derece pelvik organ prolapsusu ve 2. derece ve üstü pelvik organ prolapsusu olan 216 hasta kemik mineral yoğunluğu açısından karşılaştırılmıştır.

Bulgular: Osteoporoz açısından iki grup arasında istatistiksel bir fark saptanmaz iken (p=0,347), osteopeni çalışma grubunda istatistiksel olarak anlamlı olacak şekilde fazla saptanmıştır (p=0,012). Ek olarak, 2. derece ve üstü pelvik organ prolapsusu olan hastalarda femur boynu ve lomber vertebra T ve Z skoru kontrol grubuna göre daha düşük saptanmıştır.

Sonuç: Bu çalışmada osteopeni prevelansı 2.derece ve üstü pelvik organ prolapsusu olan grupta kontrol grubuna göre daha yüksek bulunmuştur. İkinci derece ve üstü rektosel veya sistorektosel varlığı özellikle osteopeni riskinde artışla ilişkilidir.

Anahtar Sözcükler: Pelvik Organ Prolapsusu; Osteoporoz; Kemik Yoğunluğu; Osteopeni.

Correspondance

Emrah TÖZ
Tepecik Training and Research Hospital, Obstetrics and Gynecology Clinic, İZMİR

Phone: 0232 449 49 49
e-mail: emrahtoz79@gmail.com

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[1] Tepecik Training and Research Hospital, Obstetrics and Gynecology Clinic, İZMİR
[2] İzmir Dokuz Eylül University, Faculty of Medicine, Department of Obstetrics and Gynecology, İZMİR
[3] İzmir Kent Hospital, Obstetrics and Gynecology Clinic, İZMİR

Introduction

Pelvic organ disorders are an important health concern for women, affecting their quality of life. These disorders occur as any combination of compartmental defects of vaginal support and multiple defects are common (1,2). The prevalence varies widely across studies because of underreporting and a lack of consistent definitions. The etiology of pelvic organ prolapse (POP) remains poorly understood.Reduced stability of the pelvic floor due to trauma or chronically raised intraabdominal pressure is the key underlying mechanism. Pathology specimens show insufficient collagen and changes in the extracellular matrix of the pelvic floor in patients with POP (3). Furthermore, recent studies suggest that these changes in the pelvic floor may be a focal manifestation of a systemic collagen deficiency and may extend beyond the pelvic compartment. Alterations in pulmonary compliance, joint hypermobility and skin changes are also described in patients with POP (4-6).

Similar pathophysiology is involved in the development of osteopenia and osteoporosis, which reflects deficits in bone connective tissue quality, including loss of bone mass and extracellular matrix (7,8). Osteopenia and osteoporosis are also prevalent conditions and share similar risk factors such as advancing age, smoking, glucocorticoid use and menopausal status. The National Osteoporosis Foundation predicts that by the year 2020, 14 million adults older than 50 years will be affected by osteoporosis, and this increased incidence will lead to an increase in the number of bone fractures (9).

Because of the similarities in the pathophysiology of POP and osteopenia, we hypothesized that women with stage 2 or higher POP would have a lower bone mineral density (BMD) compared with women with stage 0 or stage 1 POP, controlling for known potential confounders. In this study, we aimed to investigate the existence of a relationship between stage 2 or higher POP and BMD.

Materials and Method

This retrospective observational study was performed in the Obstetrics and Gynecology Department at Tepecik Training and Research Hospital. The institutional review board approved the study and all participants gave informed consent.

The study design and study population have been described in detail in our previously published study that investigated the existence of a relationship between POP and striae (6). Briefly, the hospital database between July 2011 and July 2012 was searched for women who underwent surgery for stage 2 or higher POP (study group). An additional search was conducted for women who underwent surgery for other benign gynecological indications with stage 0 or stage 1 POP (control group). The POP-Q system was used to quantify the severity of pelvic organ prolapse, which describes the prolapse of the 3 vaginal compartments in relation to the vaginal hymen. Overall,prolapse was classified according to the most dependent position of the leading edge of the prolapse. Four main types of pelvic organs prolapse were studied(cystocele, rectocele, cystorectocele uterovaginal prolapse) (10)In total, 1652 women aged 40–68 years with adequate medical data were identified. Patients were invited via phone to participate the study. A flow chart of the study design is presented in Figure 1.

Exclusion criteria used were as follows: adrenocortical hyperplasia, Cushing's disease, use of corticosteroids for autoimmune diseases, connective tissue diseases (e.g. Ehlers–Danlos syndrome), dermatological diseases (e.g. lichen sclerosus), use of hormone replacement therapy or BMD medications, long-term use of progesterone and use of drugs that negatively affect bone metabolism (e.g. anticonvulsants or antacids containing aluminium). Premenopausal patients were also excluded to avoid unnecessary BMD testing. The control group was created using 1:1 matching for age,parity and body mass index (BMI) using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA). Demographic characteristics including age, parity, mode of delivery and presence/absence of hypertension and diabetes were recorded. Both groups were compared in terms of BMD.

All BMD assessments were completed on a Hologic Explorer S/N 90310 scanner (Bedford, MA, USA) using Version 12.3.1:7 software. Bone density test results were reported as T and Z scores from the femoral neck and the lumbar spine, respectively.A diagnosis of osteoporosis was defined based on the World Health Organization (WHO) criteria of a T score ≤ -2.5 at any one site, osteopenia was defined as a T score > -2.5 to < -1, and normal bone density was defined as a T score ≥ -1 (11).

A pilot study found that 72% and 48% of the subjects had low BMD in stage 2 or higher POP and stage 0 or stage 1 POP groups, respectively.Based on these findings, a minimum sample size of 64 for each group would achieve 80% statistical power for detection of a difference in BMD, using $p<0.05$ to indicate significance.

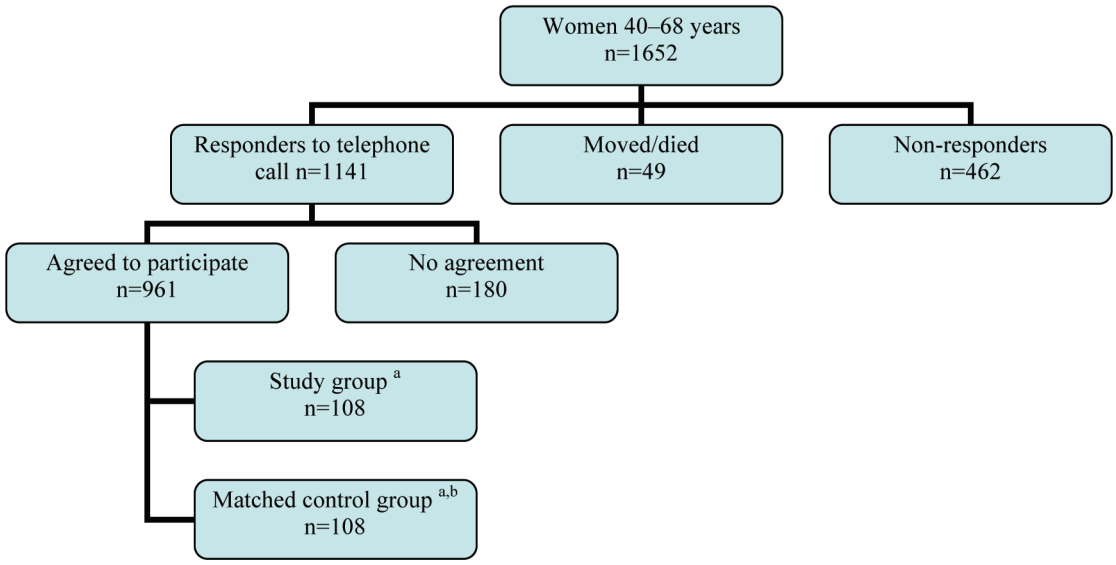


Figure 1— Flowchart of the study.
[a]Bone mineral density (BMD) evaluation was performed, and age and body mass index (BMI) were recorded for each subject.
[b]The control group was created using 1:1 matching for age,parity and BMI.

Statistical Analysis

Values for BMD were compared between women with stage 2 or higher POP and those with stage 0 or stage 1 POP. Chi-squared tests were used to analyse qualitative variances and two independent samples t-tests were used to analyse quantitative variances. Multivariate linear regression analyses were conducted to evaluate the association between BMD and POP after adjusting for covariates (age, BMI, hypertension, diabetes and smoking). Descriptive statistics were used to constitute demographic characteristics regarding variances. Logistic regression analysis was performed to calculate risk ratios. A value of $p<0.05$ was considered to indicate statistical significance. Data were analysed using Statistical Package for the Social Sciences version 18.0 (SPSS Inc., Chicago IL, USA).

Results

The mean age of 216 participants was 55.91±5.55 years. Clinical and demographic characteristics of the two groups are summarised in Table 1. Age, BMI, parity, mode of delivery, smoking status and presence/absence of hypertension and diabetes did not differ significantly between the two groups.

The mean time from surgery to BMD assessment was 10.5 months. The difference between the two groups was not statistically significant for osteoporosis ($p=0.347$) but osteopenia was significantly more prevalent in the study group compared with the control group ($p=0.012$). In addition, women with stage 2 or higher POP had significantly lower femoral trochanteric and lumbar spine T and Z scores than those with stage 0 or stage 1 prolapse (Table 2).

Multivariate analyses controlling for age, BMI, smoking status and co-morbidities revealed that women with stage 2 or higher POP were at an increased risk of osteopenia [odds ratio (OR)=1.42, 95% confidence interval (CI)=1.13–1.92] compared with those in the control group.

After the initial analysis, prolapse was classified according to the most dependent position of the leading edge into four distinct anatomical subtypes for further analysis: cystocele, rectocele, cystorectocele and uterovaginal prolapse. All these subtypes of POP were stage 2 or higher. On multivariate regression analysis, stage 2 or higher rectocele alone or with stage 2 or higher cystocele was shown to be independently associated with low BMD (OR=1.25, 95% CI=1.12–1.37, OR=1.29, 95% CI=1.14–1.35, respectively; Table 3).



Table 1— Clinical and Demographic Characteristics of the Study and Control Groups.

Characteristics	Study Group (n = 108)	Control Group (n = 108)	p
Age (years)	56.37 ± 5.43 (49–68)	55.44 ± 5.66 (48–72)	0.222
Body mass index (kg/m²)	29.06 ± 3.21 (21–38)	28.75 ± 3.12 (23–36)	0.479
Parity	3.42 ± 1.36 (2–6)	3.53 ± 1.23 (2–7)	0.142
Vaginal birth	98 (90%)	100 (%92)	0.183
Caesarean section	10 (10%)	8 (%8)	0.203
Smoking status	3 (3%)	6 (5%)	0.070
Hypertension	26 (24%)	23 (21%)	0.061
Diabetes mellitus	7 (6%)	8 (8%)	0.059
Osteoporosis	19 (17%)	14 (13%)	0.347
Osteopenia	73 (68%)	52 (48%)	0.012
Normal BMD	16 (15%)	42 (39%)	0.001

Data are shown as mean ± standard deviation (range) or n (%).

Table 2— Mean Bone Mineral Density Scores and Standard Deviations.

	Study Group	Control Group	p Value
Lumber T scores	–1,29 ± 1,30	–0,76 ± 1,32	0,003
Lumber Z scores	–0,75 ± 1,06	0,17 ± 1,42	0,001
Femur T scores	–0,70 ± 1,13	–0,21 ± 1,20	0,002
Femur Z scores	–0,43 ± 1,20	0,98 ± 1,41	0,001

Table 3— Associations Between Stage 2 or Higher POP and Osteopenia Reported as Odds Ratios and 95% Confidence Intervals (CI).

POP	n	Odds Ratio (95 % CI)	p-value
Cystocele	33	1.19 (1.14–1.25)	0.64
Rectocele	23	1.25 (1.12–1.37)	0.04
Cystorectocele	27	1.29 (1.14–1.35)	0.03
Uterovaginal prolapse	25	1.12 (0.96–1.27)	0.88
Total pelvic organ prolapse	108	1.42 (1.13–1.92)	0.03

Discussion

This study found that the prevalence of osteopenia was higher among women with stage 2 or higher POP compared with those with stage 0 or stage 1 POP. In particular, the presence of stage 2 or higher rectocele or cystorectocele was associated with an increased risk of osteopenia.

The prevalence of osteopenia in the present study group was higher than reported rates of about 50% in previous studies, similar to the prevalence in the present control group (12-14). Therefore, the high prevalence of low BMD levels in the present study group might be attributed to a common pathophysiology between pelvic floor disorders and osteoporosis.

The relationship between POP and BMD has been studied previously. In the Women's Health Initiative Estrogen Plus Progestin trial, an association was found between clinically significant POP and low BMD in postmenopausal women (15). The authors suggested that the suboptimal collagen status associated with POP might also involve bone collagen and lead to skeletal compromise. Richter HE et al. (16) investigated the association between pelvic floor symptoms and

BMD. They found that women with osteopenia were at an increased risk of faecal incontinence and women with osteoporosis were at an increased risk of large volume urinary incontinence. Pal L. et al. reported that postmenopausal women with moderate to severe prolapse had significantly lower BMD (17).

The mechanisms underlying the association between POP and decreased BMD remain unclear. However, connective tissue deficits, microarchitectural abnormalities and collagen changes have been identified in patients with low BMD and in patients with POP. A reduction in BMD results in an increased risk of osteoporosis and fractures in women (18). Osteopenia and osteoporosis are common chronic disorders which affect a substantial portion of postmenopausal women. Despite the availability of effective preventive treatments, these disorders are frequently underdiagnosed and undertreated. The most serious consequence of these disorders is fractures, which can have a serious negative effect on quality of life. Moreover, low BMD in postmenopausal women is correlated with increased mortality, especially from cardiovascular disease (19).

The early diagnosis of low BMD is vital to help maintain good bone strength during ageing and to avoid debilitating fractures. Multiple expert groups recommend screening women for osteoporosis with a bone densitometry beginning at 65 years of age. However, as reported in the present study, there is an association between stage 2 or higher POP and low BMD and therefore, screening should begin at an earlier age. Women with stage 2 or higher POP should be informed about the future risk of developing osteoporosis and should be informed about avoidable risk factors (such as smoking, sedentary lifestyle and excessive alcohol consumption) and preventive strategies to improve bone health (adequate nutrition, weight-bearing exercise, calcium and vitamin D supplements).

The strength of this study was the investigation of women who had undergone surgery for stage 2 or higher POP with adequate gynaecological examination. Previous studies that have aimed to assess the association between POP and BMD were based on self-reported symptoms (16,20). The present study also investigated possible confounding variables such as age, BMI, parity, mode of delivery, smoking status and the presence/absence of hypertension and diabetes. Women diagnosed with stage 2 or higher POP should be counselled about low BMD. Lifestyle changes and preventive strategies may be effective to decrease the prevalence of low BMD in these women, thus reducing the future risk of osteoporosis and fracture and associated costs.

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Özlem DİKMETAŞ
Mehmet Cem MOCAN
Duygu GÜLMEZ SEVİM
Murat İRKEÇ

RESEARCH

THE ASSOCIATION OF ARCUS SENILIS WITH EXFOLIATION SYNDROME AND CARDIOVASCULAR DISEASE IN ELDERLY POPULATION

ABSTRACT

Introduction: This study aimed to evaluate the relationship between commonly observed ocular conditions in older aged population, arcus senilis and exfoliation syndrome and to evaluate their association with systemic vascular disease.

Materials and Method: Seventy-five patients with arcus senilis (Group 1) and 75 patients without arcus senilis (Group 2) were included in the study. The proportion of cases with exfoliation syndrome, levels of serum cholesterol, triglycerides, high density lipoprotein, low density lipoprotein and very low density lipoprotein as well as rates of vascular disease were compared between two groups.

Results: Patients in both groups were similar with respect to age (65.7±8.5 years, 62.9±6.2 years; p=0.394). Exfoliation syndrome prevalence in group 1 (14.7%) was lower than that of group 2 (29.3%) (p=0.030). There were no significant differences between the two groups with respect to levels of serum cholesterol (200.6±46.5 mg/dl vs.189.2±41.6 mg/dl; p=0.116), serum triglycerides (4.7±0.5 log vs. 4.8±0.4log; p=0.760), high density lipoprotein (4.06±0.3log vs. 4.08±0.3log; p=0.720), low density lipoprotein (112.0±43.3 mg/dl, 118.7±37.0 mg/dl; p=0.307) and very low density lipoprotein (3.2±0.5log vs. 3.3±0.5log; p=0.528). Statistically significant differences with respect to coronary artery disease (10.7% vs. 12.0%, p=0.797) or diabetes mellitus (18.7% vs. 30.7%; p=0.088) were not detected between the two groups. Hypertension was observed more frequently in patients without arcus senilis (12.0% vs. 37.3%; p<0.001).

Conclusion: Exfoliation syndrome was observed more frequently in patients without arcus senilis. Arcus senilis and exfoliation syndrome do not appear to be associated with coronary artery disease.

Key Words: Arcus Senilis; Coronary Artery Disease; Exfoliation Syndrome; Hyperlipidemias.

ARAŞTIRMA

YAŞLI HASTALARDA ARKUS SENİLİSİN EKSFOLİASYON SENDROMU VE KARDİYOVASKÜLER HASTALIKLAR İLE İLİŞKİSİ

ÖZ

Giriş: Bu çalışmada, yaşlı nüfusta sık görülen arkus senilis ile eksfoliasyon sendromu birlikteliğinin, sistemik vasküler hastalıklar ile ilişkisinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışmaya arkus senilis bulunan 75 olgu (Grup 1) ile arkus senilis tespit edilmeyen 75 olgu (Grup 2) dahil edilmiştir. Tüm olguların eksfoliasyon sendromu varlığı ve serum kolesterol, trigliserid, yüksek yoğunluklu lipoprotein, düşük yoğunluklu lipoprotein, çok düşük yoğunluklu lipoprotein değerleri saptanmış, vasküler hastalıkları değerlendirilmiştir.

Bulgular: Yaş ortalamaları her iki grupta benzer bulunmuştur (65,7±8,5 yaş, 62,9±6.2 yaş; p=0,394). Eksfoliasyon sendromu prevelansı grup 1 de (%14,7) grup 2'den (%29,3) düşük bulunmuştur (p=0,030). Gruplar arasında serum kolesterol düzeyi (200,6±46,5 mg/dl, 189,2±41,6 mg/dl; p=0,116), serum logaritmik trigliseridleri (4,7±0,5 log, 4,8±0.4log; p=0,760), logaritmik yüksek yoğunluklu lipoprotein (4,06±0.3log, 4,08±0.3log; p=0,720), düşük yoğunluklu lipoprotein (112,0±43,3 mg/dl, 118,7±37.0 mg/dl; p=0,307) ve logaritmik çok düşük yoğunluklu lipoprotein (3,2±0.5log, 3,3±0.5log; p=0,528) açısından fark saptanmamıştır. İki grup arasında koroner arter hastalığı (%10,7, %12,0, p=0,797) ve diabetes mellitus (%18,7, %30,7; p=0,088) açısından istatistiksel anlamlı fark saptanmamıştır. Hipertansiyonun arkus senilis bulunmayan grupta daha sık görüldüğü saptanmıştır (%12,0, %37,3; p<0,001).

Sonuç: Bu çalışmada arkus senilis bulunmayan grupta eksfoliasyon sendromu daha sık saptanmıştır. Geriatrik yaş grubunda sıklıkla görülen arkus senilis ve eksfoliasyon sendromunun koroner arter hastalığı ile ilişkisi mevcut değildir.

Anahtar Sözcükler: Arkus Senilis; Koroner Arter Hastalığı; Eksfoliasyon Sendromu; Hiperlipidemi.

Correspondance

Özlem DİKMETAŞ
Hacettepe University, Faculty of Medicine, Department of Ophthalmology, ANKARA

Phone: 0312 305 17 77
e-mail: ozlemdikmetas@gmail.com

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Hacettepe University, Faculty of Medicine, Department of Ophthalmology, ANKARA



INTRODUCTION

Arcus senilis, also referred to as corneal arcus, is a grey white yellowish opacity located at the peripheral cornea. It forms from deposition of cholesterol esters, phospholipids and neutral triglycerides at the edge of Bowman's layer and is seperated from the limbus with a lucent zone (1). Arcus senilis is an age related corneal finding and is readily detectable with biomicroscopic examination. Arcus senilis begins at the inferior and superior poles of the cornea and progresses to encircle the entire circumference of the peripheral cornea. The prevalence of corneal arcus increases with age, up to a reported prevalence of >80% in persons older than 60 years and is more common in men than women regardless of age or race (2). Arcus senilis has been shown to be associated with atherosclerotic vessel disease, obesity, dyslipidemia, insulin resistance and type 2 diabetes and thus is regarded as an alerting ocular symptom for cardiovascular disease (1,3). Previous investigators reported a higher prevalence of coronary heart disease in subjects with arcus senilis than those without, especially in those younger than fifty years of age (4). Various cardiovascular risk factors were found to be associated with corneal arcus, including hyperlipidemia, hypertension, higher body mass index (BMI), diabetes mellitus and cigarette smoking (5).

Exfoliation syndrome (XFS) is a common age-related systemic fibrillopathy of unknown etiology that mainly affects the geriatric population in certain geographic locations such as Iceland, Scandinavia, Turkey, Greece and Saudi Arabia (6). In certain populations, 5-40% of the geriatric population over 70 years of age has been shown to have ocular signs indicative of XFS (7,8). XFS arises secondary to deposition of fibrillogranular material throughout the entire anterior segment of the eye including the lens capsule, ciliary body, zonules and corneal endothelium (6). It is a known risk factor for secondary open angle glaucoma, cataract, lens subluxation and increased inflammation following intraocular procedures (9). From a systemic standpoint, XFS has been found to increase susceptibility to cardiovascular disease (10, 11), peripheral vascular disease (12), cerebrovascular disease (13), small vessel disease (14) as well as neurodegenerative disorders (15). Hypoxia has been implicated as a pathogenetic factor in the development of XFS (14). Furthermore, increased level of inflammatory markers such as IL 6, IL8, TGF-, in ocular fluids of patients with XFS suggest that inflammation could also be involved in the pathogenesis of vascular disease associated with XFS (11). Overall, the findings of previous studies suggest that both arcus senilis and exfoliation syndrome share similar mechanisms for the formation of atherosclerotic plaques. Thus, the possibility of a common underlying link such as hypoxia may exist between the XFS, arcus senilis and vascular disease (16).

In this aspect, since both arcus senilis and XFS are linked to systemic vascular disorders and are easily recognizable with routine eye examinations, they could have a potential value in alerting the physician to the presence of systemic vascular disease. Therefore, the aim of this study was to look into the possible association between arcus senilis and XFS and to determine whether arcus senilis and XFS individually or in combination could be used as potential surrogate markers for hyperlipidemia, coronary heart disease, diabetes mellitus or hypertension.

MATERIALS AND METHOD

An observational case-control study was undertaken at a single university based hospital from September 2011 to October 2012. The research adhered to the tenets of the Declaration of Helsinki, informed consent was obtained from all participants and the study was carried out with approval from the Institutional Ethical Review Board. Patients who were over the age of 40 years and whose medical data was evaluable for evaluation were consecutively included in both groups. Arcus senilis was defined as deposition of whitish-grey lipid material in the peripheral corneal stroma seperated from the limbus with a clear zone. Subjects with arcus senilis were designated as cases (Group 1, n=75 patients) and those without arcus senilis constituted the controls (Group 2, n=75 patients) (Table 1). Patients in both groups were consecutively recruited into the study. All patients underwent a complete ocular examination consisting of slit-lamp biomicroscopy, fundus examination and intraocular pressure evaluation. The presence of arcus senilis and XFS were specifically evaluated. The diagnosis of XFS was established upon the detection of fibrillogranular material deposited on the anterior lens capsule and/or the pupillary border (Figure 1). Data from patients' lipid profile were recorded. All patients had to have prior blood samples obtained within 12 months of their eye examination to be included into the study. Subjects without a serum lipid profile [total cholesterol, triglycerides, high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL)] within the last 12 months were excluded. Detailed medical history details of all participants were recorded. Pertinent details included hypertension, diabetes mellitus, coronary heart disease and their medication history. A positive history of myocardial infarction, coronary

Table 1— Demographic and Clinical Characteristics of Subjects Included in the Study.

Parameter	Subjects with Arcus Senilis (n=75)	Subjects without Arcus Senilis (n=75)	p
Age (years)	65.7±8.5	62.9±6.2	0.394
Gender (F/M)	30/45	51/24	0.001*
Presence of XFS n (%)	11 (14.7)	22 (29.3)	0.030*
Coronary Artery Disease n (%)	8 (10.7)	9 (12.0)	0.797
Diabetes Mellitus n (%)	14 (18.7)	23 (30.7)	0.088
Hypertension n (%)	9 (12.0)	28 (37.3)	<0.001*

XFS: Exfoliation syndrome; F: Female; M: Male.
* Significant p<0.05.

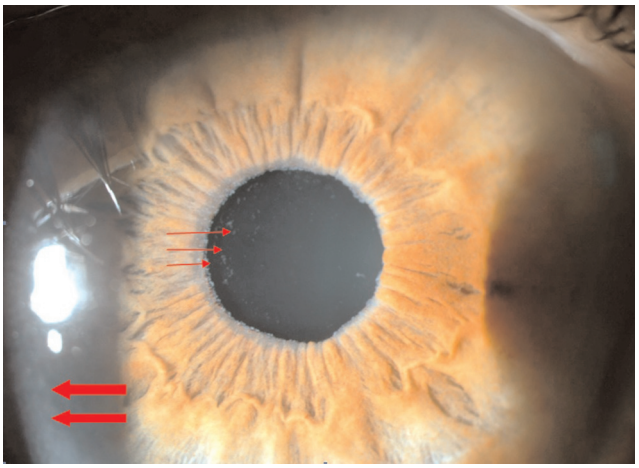


Figure 1— Slit lamp biomicroscopic appearance of an eye with arcus senilis (thick arrows) and exfoliation syndrome (arrows).

artery bypass surgery, angioplasty and angina pectoris was considered as positive markers for the presence of cardiovascular disease. Hypertension was defined as a diastolic blood pressure of ≥90 mm/Hg and a systolic blood pressure of ≥160 mm/Hg. SPSS v.18.0 (IBM, New York, USA) was used for all statistical analyses. Student's t test, Pearson correlation analysis or Mann Whitney U test were used for group comparisons. A p value of less than 0.05 was considered significant.

Results

The baseline characteristics of all patients are highlighted in Table 1. There were no significant differences between the mean ages of group 1 and group 2 (p=0.394). XFS was observed in 22.0% of all subjects (n=150) and was more frequent in subjects *without* arcus senilis (29.3%) than those with arcus senilis (14.7%) (p=0.030) (Figure 2).

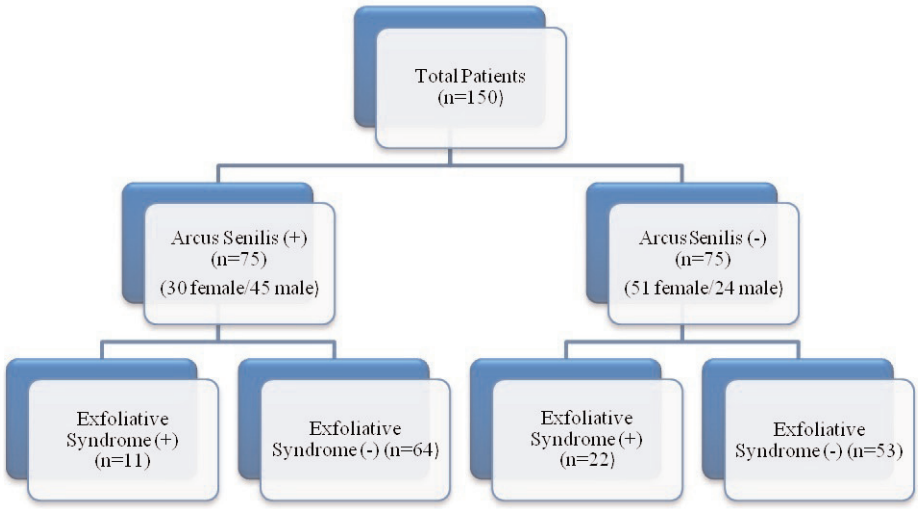


Figure 2— The study design and the number of study subjects allocated to each study group is demonstrated.



Additionally, arcus senilis conferred a protective effect for XFS (OR=0.414, 95%CI, p=0.0329). The distribution of subjects in the two groups with respect to systemic illness such as diabetes mellitus and coronary artery disease was not significantly different (Table 1). Hypertension was observed more frequently in subjects without arcus senilis (p<0.001). The mean serum lipid levels of both groups were also found to be similar (Table 2).

DISCUSSION

Arcus senilis represents deposits of cholesterol ester rich lipid particles, which are selectively trapped in the extracellular matrix in the corneal stroma. Arcus senilis formation is believed to be accelerated in the presence of high plasma LDL levels as LDL is the major source of the cholesterol esters that accumulate in the cornea (17). In our study, LDL levels were comparable between subjects with arcus senilis (112.0±43.3 mg/dl) and those without (118.7±37.0 mg/dl) (p=0.307). Arcus senilis has also been associated with diabetes mellitus, smoking, blood pressure, obesity and age (17). We found that among subjects with arcus senilis, 8 patients (10.7%) had coronary artery disease, 14 had (18.7%) diabetes mellitus and 9 had hypertension (12.0%) and that the prevalence of these diseases were not different in subjects without arcus senilis (Table 2), suggesting that the presence of arcus senilis does not increase the probability of the above mentioned vascular diseases. However, in previous population based investigations and hospital based studies, arcus senilis was found to be associated with older age, male sex, hyperlipidemia, dyslipoproteinemias including familial hypercholesterolemia, atherosclerosis and coronary artery disease (17,18). Thus, our findings could be representative of the Turkish population.

In a study of Christoffersen et al. in which 12745 people aged 20-93 years were followed for 31 to 33 years, the risk of ischemic heart disease was reported to be stronger when both xanthelasmata and arcus senilis were present (19). In another study by Vurgese et al. in which randomly selected 952 people were evaluated, arcus senilis was found to be significantly associated with age, lower intraocular pressure, thinner central cornea and hyperopic refractive error (3). However, in the same report, arcus senilis was not associated with serum levels of HDL, cholesterol, creatinine, glucose and glycosylated hemoglobin. It was concluded that arcus senilis was not a clinical biomarker for major metabolic disorders (3). Our data appears to be in agreement with the results of Vurgese et al.

Chen et al. followed 238 patients aged 30-60 years who were evaluated for the association of arcus senilis, serum lipid profile and coronary artery disease. In that study, systolic blood pressure was inversely correlated with arcus senilis (4). In our study we also found an inverse correlation for hypertension and arcus senilis.

In a population based cross sectional study by Ang et al. involving 3397 people aged 40-80 years, it was found that arcus senilis was associated with coronary artery disease, independent of other risk factors in ethnic Indian adults, even in those at low risk for vascular disease (1). Hickey et al. followed 534 patients who were investigated for the association of arcus senilis, serum lipid profile and coronary artery disease (20). Frequency and degree of arcus were positively associated with age and with lifetime alcohol intake. In another study by Pe'er et al. in which randomly selected 150 people were evaluated, no associations were found between arcus senilis and other coronary artery disease risk factors such as high triglyceride, HDL, LDL, VLDL levels, obesity and smoking (18).

In the Singapour Malay Eye Study in which 3280 subjects aged 40-80 years were investigated, the serum C-reactive protein (CRP) levels as well as the presence of chronic kidney disease and peripheral artery disease were determined (5). Arcus senilis was determined from anterior segment images taken with a slit-lamp camera. The odds ratio of demonstrating

Table 2— Serum Lipid Profiles of the Patients Included in the Study.

Parameter	Subjects with Arcus Senilis (n=75)	Subjects without Arcus Senilis (n=75)	p
VLDL (log)	3.2±0.5	3.3±0.5	0.528
LDL (mg/dl)	112.0±43.3	118.7±37.0	0.307
TG (log)	4.7±0.5	4.8±0.4	0.760
HDL (log)	4.06±0.3	4.08±0.3	0.720
Total Cholesterol (mg/dl)	200.6±46.5	189.2±41.6	0.116

HDL: High density lipoprotein; LDL: Low density lipoprotein; VLDL: Very low density lipoprotein; log: logarithmic transformation.

arcus senilis was 1.21 permmol/L for total cholesterol, 1.94 permmol/L for LDL, 3.85 permmol/L for peripheral artery disease, 1.14 permmol/L for chronic kidney disease and 1.29 permmol/L for smoking. This study confirmed that arcus senilis was associated with systemic inflammatory markers, peripheral artery disease and chronic kidney disease (5).

XFS is a complex systemic fibrillopathy with an inflammatory component which primarily effects eye and visceral organs (6,7,13). In previous studies, both XFS and arcus senilis were found to be independently associated with age, vascular disease and inflammation (1,6). However, the findings of our study revealed a statistically significant inverse association between XFS and arcus senilis (p=0.030) and suggest that from a clinical standpoint, arcus senilis develops independently of XFS. Furthermore, the findings of our study suggest that arcus senilis may be protective for XFS (OR=0.414, 95%CI, p=0.0329). In previous studies, XFS has been also found to be related to vascular, cerebrovascular and cardiovascular diseases (9) although not all studies have confirmed these associations (21,22). In our study AS was not found to be statistically associated with coronary artery disease (p=0.797).

In the Blue Mountain Eye Study, XFS was seen in 81 (2.3%) patients of 3546 participants. Its prevalence was increased with age, in females, and in subjects with a history of angina, acute myocardial infarction and stroke (23). Of importance, arcus senilis was predictive of cardiovascular disease and coronary artery disease in elderly individuals due to its association with age. The findings suggested that arcus senilis and XFS are both ocular markers for proatherogenic changes (12,17). Our study is unique in that, to the best of our knowledge, it was the first study to analyze the possible association of XFS with arcus senilis. Our findings were unable to reveal a meaningful negative relationship between these two disorders. Thus, we conclude that these two ocular conditions that arise in the aging population have different pathogenetic mechanisms and the presence of one condition does not have any predictive value as to the presence of the other.

In conclusion, the results from this study reveal that arcus senilis is not associated with coronary artery disease, diabetes mellitus, hypertension and blood lipid levels in Turkish elderly population. Arcus senilis appears to be a protective factor for the development of XFS. Further investigations are necessary to understand whether the relationship between arcus senilis and cardiovascular risk factors/disease is affected by race and/or geographic location.

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Mehmet YAŞAR[1]
Mustafa SAĞIT[1]
Halil POLAT[1]
Sabri GÜLER[3]
Orhan GÖRGÜLÜ[2]
İbrahim ÖZCAN[1]

Correspondance

Mehmet YAŞAR
Kayseri Training and Research Hospital,
Otorhinolaryngology-Head and Neck Surgery Clinic,
KAYSERİ

Phone: 0352 336 88 84
e-mail: drmyasar@hotmail.com

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[1] Kayseri Training and Research Hospital, Otorhinolaryngology-Head and Neck Surgery Clinic, KAYSERİ
[2] Adana Numune Training and Research Hospital, Otorhinolaryngology-Head and Neck Surgery Clinic, ADANA
[3] Bigadiç State Hospital, Otorhinolaryngology Clinic, BALIKESİR

RESEARCH

AN ASSESSMENT OF OLFACTORY FUNCTION IN AN ELDERLY POPULATION

ABSTRACT

Introduction: It is estimated that the prevalence of olfactory dysfunction in the general population varies from 3% to 8%. However, in elderly populations, particularly in those older than 65 years of age, the prevalence exceeds 60%. In this study, we compared the olfactory function of an elderly population with young healthy individuals using the Sniffin' Sticks smell identification test.

Materials and Method: All subjects had presented to the Kayseri Training and Research Hospital between May 2013 and May 2014. One-hundred and seven patients older than 60 years of age were included in one group, while twenty one healthy volunteers younger than 60 years of age were included in the second group. Twelve odours were tested in all subjects using Sniffin' Sticks Test. Answers were recorded and calculated as Sniffin' Sticks Test score, which was used to classify patients as follows: 10–12 points, normosmic; 7–9 points, hyposmic; and 0–6 points, anosmic.

Results: The average elderly population Sniffin' Sticks test score (7.97±2.2) was significantly lower than that of the young healthy population (10.86±1.06) (p<0.001). In the elderly population, 14% were classified as normosmic, 71% were hyposmic and 15% were anosmic. Furthermore, there was no significant difference in total smell score between genders (p=0.799).

Conclusion: It was found that Sniffin' Sticks Test score were significantly lower in an elderly population when compared to a young population. Further comprehensive studies evaluating additional parameters such as odour threshold and perception are needed in elderly population.

Key Words: Smell; Identification; Geriatrics.

ARAŞTIRMA

YAŞLI POPULASYONDA KOKU FONKSİYONUNUN DEĞERLENDİRİLMESİ

ÖZ

Giriş: Olfaktör fonksiyon bozukluğu toplumda %3-8 oranında tahmin edilmektedir, ama yaşın ilerlemesi ile birlikte özellikle 65 yaş sonrası toplumun %60'dan fazlası bu durumdan etkilenir. Bu çalışmada, yaşlılarla birlikte sağlıklı genç bireylerin koku fonksiyonları Sniffin Sticks Koku Tanımlama Testi kullanılarak karşılaştırıldı.

Gereç ve Yöntem: 2013 Mayıs-2014 Mayıs ayları arasında Kayseri Eğitim Araştırma Hastanesine gelen 60 yaş ve üzeri 107 hasta 1. gruba, 21 hastadan oluşan sağlıklı 60 yaş altı gönüllüler 2. gruba alındı. Bütün bireylerde Sniffin Sticks Testi kullanılarak 12 koku değerlendirildi. Verilen cevaplar kayıt altına alınıp 12 üzerinden Sniffin Sticks Testi skoru hesaplanarak hastalar 3 gruba ayrıldı; 10-12 puan normozmik, 7-9 puan hipozmik ve 0-6 puan alanlar anozmik.

Bulgular: Yaşlı grubun Sniffin Sticks Testi değeri 7,97±2,2, sağlıklı genç gönüllülerde ise Sniffin Sticks Testi skoru 10,86±1,06 olup istatistiksel olarak fark anlamlıydı (p<0,001). Yaşlı populasyonda normozmik olanlar %14, hipozmik olanlar %71 ve anozmik olanlar %15 idi. Buna ilaveten, total koku skoru açısından cinsiyet bakımından istatistiksel olarak anlamlı fark yoktu (p=0,799).

Sonuç: 60 yaş üzeri yaşlı populasyonda istatistiksel olarak genç populasyona göre Sniffin Sticks Testi skorunun düşük olduğu saptandı. Yaşlı populasyonda koku eşiği ve koku algısı gibi ek parametrelerinde bakıldığı daha kapsamlı çalışmaların yapılmasına ihtiyaç vardır.

Anahtar Sözcükler: Koku, Tanımlama; Geriatri.



Introduction

Olfaction has an important role in the quality of life (1) and it allows us to recognise environmental hazards such as fire, decomposed foods and gas leaks. It is estimated that the prevalence of olfactory dysfunction varies from 3% to 8% in the general population. However, in elderly populations, particularly in those older than 65 years of age, the prevalence exceeds 60% (2-4). It is important to make the discrimination between physiological (presbiosmia) and unexplained olfactory dysfunction (5). A recent study has demonstrated that a small percentage of olfactory dysfunction in the elderly is due to presbiosmia. Olfactory dysfunction can be due to damage to the olfactory epithelium caused by trauma, toxins or drugs (6). Standardised tests such as Sniffin' sticks, which are widely accepted and compatible with community sociocultural structures, are needed to assess olfactory function in elderly populations.

In this study we aimed to compare the Sniffin' sticks smell identification results obtained from an elderly Turkish population with those obtained from healthy young individuals.

Materials and Method

Patient Selection

The study was approved by the Ethics Committee of Erciyes University (Approval#2013/382). From patients presenting to the Kayseri Training and Research Hospital between May 2013 and May 2014, 107 older than 60 years of age were included in the first group, while 21 healthy volunteers younger than 60 years of age were included in the second group. All patients underwent a rhinological examination at the ENT and Head & Neck Surgery Clinic of Kayseri Teaching Hospital. Subjects with prominent septal deviation, allergic rhinitis, nasal polyposis or rhinosinusitis were excluded. In addition, subjects with diabetes mellitus, smokers, those with neurological deficits and those receiving drugs, which could affect olfaction, such as ACE inhibitors, Calcium canal blockers, statins, diuretics or antidepressants were also excluded.

Assessment of Olfactory Function

Smell test sticks were used within six months of the production date, in accordance with the manufacturer's instructions. Smell identification tests were performed in a well-ventilated room by the same operator who was instructed not to use perfume or powdered gloves. Twelve odours were tested by holding Sniffin' sticks 2 cm from the right and left nostrils for 3 seconds with 30second intervals. After sniffing each odour the subjects were asked to complete a four item questionnaire. The answers allowed a Sniffin' Sticks Test (SST) score to be calculated. The subjects were classified according to their SST scores as follows: 10-12 points, normosmic; 7-9 points hyposmic; and 0–6 points anosmic. In addition, subjects were further classified into three groups according to a subjective rating of olfactory function (good, fair and poor) that was estimated by using a percentile scale and SST scores.

Statistical Analysis

All statistical analyses were performed using SPSS for Windows Version 16.0. Smell scores were compared between groups using the Student's *t*-test. Nominal values were compared by using the X^2 test. $p<0.05$ was considered as statistically significant.

Results

One-hundred and seven patients (55 men and 52 women) comprised the first group (elderly patients), while21 subjects (15 men and 6 women) comprised the second group (young healthy subjects). There was no significant difference between groups regarding gender (p=0.101). The mean age was 68.3±5.6 years in the first group and 36.9±7.4 years in the second group (significance, p<0.001).

The average SST score was significantly lower in the elderly group (7.97±2.2) than in the young healthy group (10.86±1.06) (p<0.001). In the elderly population, the SST score was 7.93±2.21 in males and 8.04±2.28 in females. There was no significant difference in SST between genders (p=0.799).

Regarding the elderly population, 14% were classified as normosmic, 71% were hyposmic and 15% were anosmic. There was no significant difference in gender among normosmic, hyposmic and anosmic patients (p=0.772). Regarding the young healthy group, 85.7% were normosmic and 14.3% were hyposmic. No anosmic individual was recorded. There was a significant difference between the groups regarding the frequency of normosmia, anosmia and hyposmia (p<0.001). In the elderly population, olfactory function was classified as poor in 84.1%, fair in 14% and good in 1.9% of patients (Table 1). In the second group, it was classified as poor in 28.6%, fair in 33.3% and good in 38.1% of subjects. There was a significant difference between groups regarding olfactory function (p<0.001). An assessment according to gender revealed that there was no significant difference in olfactory

Table 2— Comparison of Percentage and Mean Values Between Groups Regarding Gender, SST Score, Subjective Odour Classification, Hyposmia and Anosmia.

	Group 1	Group 2	p
Age	68.3±5.6	36.9±7.4	0.001
Female	52	6	0.001
Male	55	15	0.001
SST score	7.97±2.2	10.86±1.06	0.001
Hyposmic (%)	71	14.3	0.001
Anosmic (%)	15	0	0.001
Normosmic (%)	14	85.7	0.001
Good (%)	1.9	38.1	0.001
Fair (%)	14	33.3	0.001
Poor (%)	84.1	28.6	0.001

function between genders in the elderly population (p=0.863).

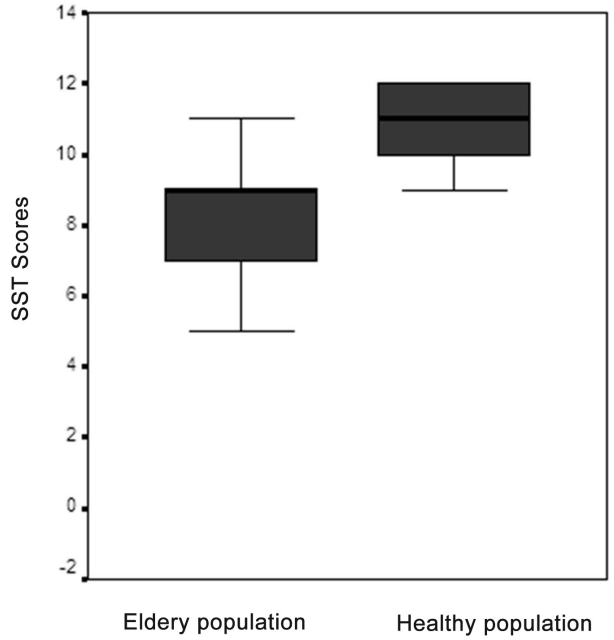


Figure 1— Comparison of Sniffin' Sticks Test (SST) scores.

Discussion

Many studies have shown that olfactory sensitivity decreases with advancing age (7-11). Conditions where hearing and vision become physiologically blunted, such as presbycusis or myopia, are common in the elderly population. Similarly, presbiosmia, where olfaction is physiologically decreased, has also been reported to be common in this population (5). Age-related olfactory disorders may be associated with neural and cortical pathways, physiological alterations such as memory deficits, a decreased blood flow of olfactory epithelium, increased mucus viscosity or decreased metabolic activity (8). Furthermore, it is known that there is a decrease in olfaction associated with decreased mental and cognitive function, such as in Alzheimer's and Parkinson's diseases. In a large epidemiological study from the USA (n=2491), it was reported that olfactory function was reduced by 24.5% in the elderly population (12). In a study that investigated the relationship between malnutrition and olfactory function in 191 geriatric patients by using SST scores, hyposmia was found in 39.3% and anosmia in 31.9% of subjects (13).

Here, we found hyposomia in 71% and anosmia in 15% of the elderly population. This data contrasts with the young healthy group where 14% were found to be hyposmic and 86% were found to be normoosmic, with no anosmic individual detected. Between groups there was a significant difference in SST scores (p<0.001). Compared to our study, the study of Smoliner et al. (13) used older subjects (79.6±6.3 compared to68.3±5.6 years), as well as some patients with malnutrition. Although no correlation was detected between olfaction and nutritional status in that study, the percentage of anosmic patients was higher than described here. The smell identification test is produced in Germany in accordance with the sociocultural status and lifestyle of that region. Moreover, it has also been reported that environmental and climatic conditions may affect olfaction (8,14,15). We suspect that the differences between these two studies are not related to climate, as there is little climatic variation between Turkey and Central Europe. Interestingly, our elderly population experienced difficulty in defining liquorice and pineapple odours. In Turkey, tropical fruits aren't commonly consumed due to socioeconomic reasons and this may therefore effect the SST results. It has also been reported in a German study that cultural and geographic factors may play a role in the divergence from local normative values of olfaction (6). In our study, the number of hyposmic patients was found to be higher than in the German study, while the number of anosmic patients was lower.

The effects of hormones on olfactory function haven't been fully elucidated (16,18). In a study by Katotomichelakis et al. (2008), it was found that the olfactory threshold and smell

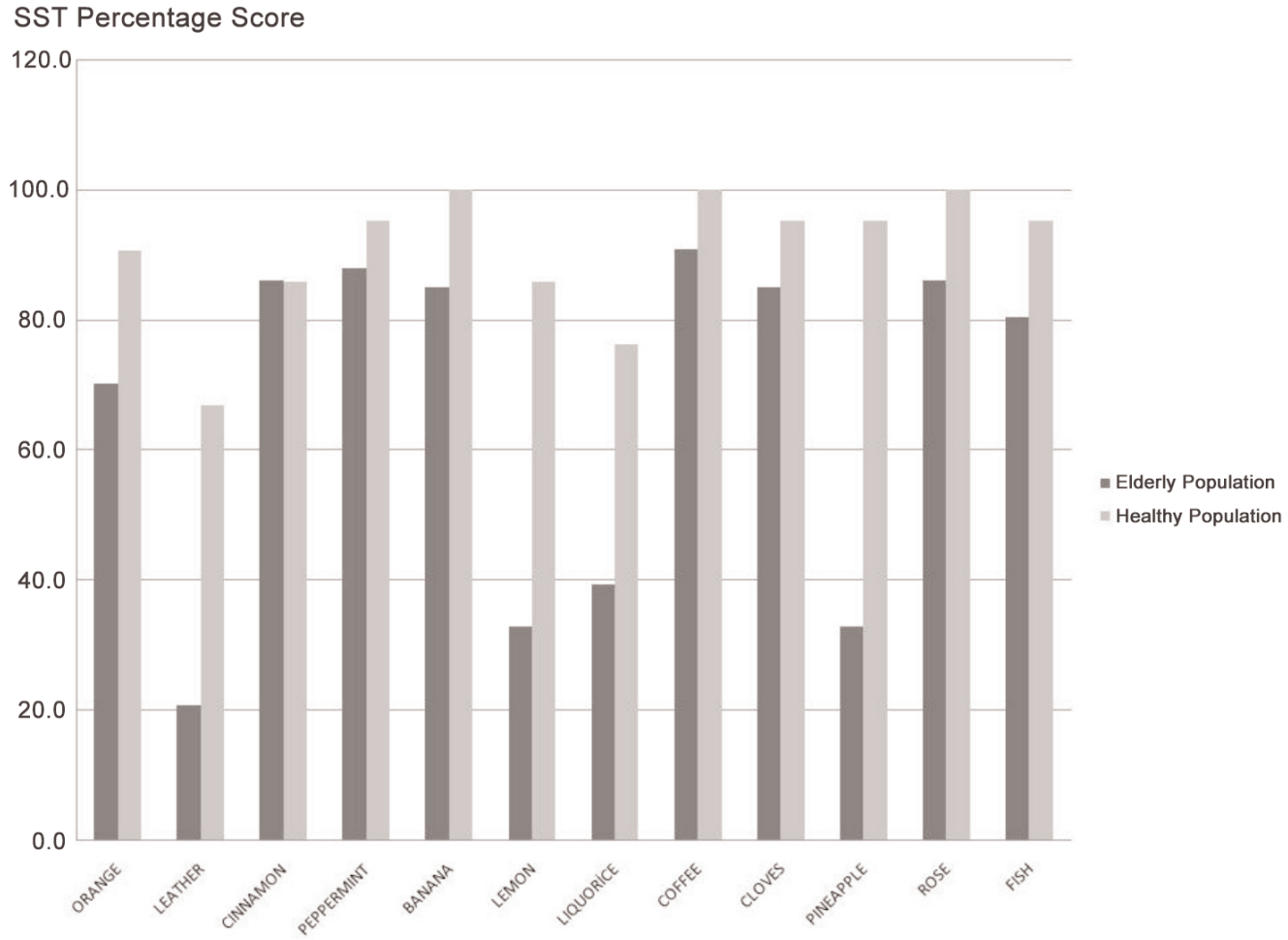


Figure 2— Sniffin' Sticks Test (SST); percentage of correct answers in smell identification are given separately.

identification scores were markedly higher in women when compared to men. The positive effects of hormones on olfactory epithelium were linked largely to oestrogen. In addition, Dhong et al. reported that oestrogen had a protective effect on rats in which experimental olfactory dysfunction was induced (19). This may be associated with the regulatory effect of oestrogen on the secretory activity of mucosal membranes. However, in a study of 3000 cases by Hummel et al., no difference was found in smell identification scores between genders (20), and Smoliner et al. found that there was no significant difference in smell identification scores between men and women. Nevertheless, in several additional studies it has been reported that olfactory function is lower in men when compared to women (3, 21). In a study by Schubert et al., it was reported that the reduction in olfactory function was 2-fold higher in men compared to women. In our study, there was no significant difference in SST scores between men and women in the elderly population (p=0.799). In addition, there was no significant difference between men and women regarding olfactory function classified as good, fair or poor (p=0.863). Furthermore, no significant difference was found between elderly men and women regarding hyposmia, anosmia or normosmia (p=0.772). Presumably, the decrease in oestrogen secretion in postmenopausal women abolishes their gender superiority regarding smell identification testing. There is a need for further studies involving oestrogen levels and their effects on olfactory function.

In conclusion, in a Turkish geriatric population, it was found that odour perception was significantly lower when compared to a young healthy population. We found that there was

anosmia in 15% and hyposmia in 71% of the elderly population. In contrast, an elderly population from Germany displayed rates of hyposmia and anosmia of 39.3% and 31.9%, respectively. This difference may be due to variations in climate and lifestyle. We conclude that olfactory test batteries should be prepared considering the sociocultural conditions of specific countries. Further comprehensive studies evaluating odour thresholds and other parameters of odour, as well as odour perception in geriatric populations, are needed.

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Hande ŞAHİN

RESEARCH

RESEARCH ON UNIVERSITY STUDENTS' ATTITUDES ABOUT ELDERS AND ELDER DISCRIMINATION

ABSTRACT

Introduction: This research was planned and conducted to determine the attitudes of university students toward elders and elder discrimination.

Materials and Method: The research sample consisted of 584 students studying in the Faculty of Economics and Administrative Sciences, Karabük University. The study protocol was approved by the university research ethics committee and informed consent was obtained from all individuals who agreed to participate the study. Elder discrimination attitude scale was used as a data-gathering tool. This scale consisted of the following subdimensions-"limitation of the lives of elders," "positive attitudes toward elders," and "negative attitudes toward elders."

Results: Of the students participating in the research study, 37.3% were males, and 62.7% were females. In the subdimension "limitation of the life of elders," the most positive approach was "care of elders should not be seen as a financial burden by family members." In the subdimension "positive attitudes toward elders," the most positive attitude was shown to be that "priority should be given to elders in queues," and in the subdimension "negative attitudes toward elders," the most positive approach was that "the main responsibility of elders is helping their children with tasks such as household and kitchen chores and in the care of grandchildren."

Conclusion: The study found that students in the Faculty of Economics and Administrative Sciences, Karabük University had a positive approach toward elders and respected elders and cared about them.

Key Words: Discrimination (Psychology); Aged; Students.

ARAŞTIRMA

ÜNİVERSİTE ÖĞRENCİLERİNİN YAŞLI AYRIMCILIĞINA İLİŞKİN TUTUMLARININ İNCELENMESİ

ÖZ

Giriş: Bu araştırma, üniversite öğrencilerinin yaşlı ayrımcılığına ilişkin tutumlarını belirlenmek amacıyla planlanmış ve yürütülmüştür.

Gereç ve Yöntem: Araştırmanın örneklemine Karabük Üniversitesi İktisadi ve İdari Bilimler Fakültesi'nde öğrenim gören 584 öğrenci alınmıştır. Çalışma protokolü etik komite tarafından onaylanmış ve onay çalışmaya katılmayı kabul edenlere bildirilmiştir. Veri toplama aracı olarak "Yaşlı Ayrımcılığı Tutum Ölçeği" kullanılmıştır. Ölçek, "yaşlının yaşamını sınırlama" alt boyutu, "yaşlıya yönelik olumlu ayrımcılık" alt boyutu ve "yaşlıya yönelik olumsuz ayrımcılık" alt boyutlarından oluşmaktadır.

Bulgular: Araştırmaya alınan öğrencilerin %37,3'ü erkek, %62,7'si de kızdır. "Yaşlıların Yaşamını Sınırlama" alt boyutunda en olumlu tutum "Yaşlıların bakımı aile bireyleri tarafından ekonomik yük olarak görülmemelidir" maddesinde, "Yaşlıya Yönelik Olumlu Ayrımcılık" alt boyutuna ilişkin "Sıra beklenmesi gereken yerlerde yaşlılara öncelik verilmelidir" maddesinde ve "Yaşlıya Yönelik Olumsuz Ayrımcılık" alt boyutuna ilişkin ise "Yaşlıların temel sorumluluğu ev ve mutfak işleri, torun bakımı gibi konularda çocuklara yardımcı olmaktır" maddelerinde gösterilmiştir.

Sonuç: Karabük Üniversitesi İktisadi ve İdari Bilimler Fakültesi'nde öğrenim gören öğrencilerin yaşlı ayrımcılığı ile ilgili olumlu tutuma sahip oldukları belirlenmiştir. Gençler yaşlı bireylere saygı göstermekte ve onları önemsemektedirler.

Anahtar Sözcükler: Ayrımcılık; Üniversite Öğrencisi; Yaşlı.

Correspondance

Hande ŞAHİN
Kırıkkale University, Department of Social Work, KIRIKKALE

Phone: 0318 357 37 38
e-mail: hande_k1979@yahoo.com

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Kırıkkale University, Department of Social Work, KIRIKKALE

INTRODUCTION

Old age is a natural, an unavoidable, and an inevitable process for all people, just like other stages of life. The aging process occurs early or late and is more or less problematic depending on genetic inheritance, nutrition, environmental conditions, and the sociocultural efforts of each individual. According to an analysis done by the World Health Organization (WHO), ages ranging 45–59, 60–74, 75–89, and 90 or above are considered to be middle age, early old age, old age and advanced old age, respectively (1).

According to the report of the World Health Organization, the fertility rate is decreasing in all countries, causing the population to age. This quick decline in the fertility rate increased the percentage of the aging population (1,2). The increase in the elder population in the developed and developing countries, increases in urbanization, and the popularization of nuclear family cause serious problems in countries around the world, in families, and in society. A communal and social result of these problems is elder discrimination (3).

Research has shown that discrimination against elderly is due to the physical, mental, and psychological changes they undergo during aging. According to literature, mostly youth discriminates against the elderly (4). However, while some studies show that university students have negative attitudes toward the elderly (5-7), others show positive attitudes (8-10). Therefore, this study was planned and conducted to determine the attitudes of university students toward elders and whether they discriminate against this older age group.

MATERIALS AND METHOD

Participants

The universe of participants in this study consisted of first- and second-year students in the Faculty of Economics and Administrative Sciences departments (Economics, International Relations, and Public Administration) of Karabük University. The research did not use the sampling method, but it aimed to reach all of the students in the defined universe. In this context, the universe consisted of 584 students. The study protocol was approved by the university research ethics committee and informed consent was obtained from all individuals who agreed to participate the study.

Data Collection

Data were collected in a survey form consisting of two parts. In the first part of the survey, there were variables for determining the characteristics of students. In the second part, there was an "elder discrimination attitude scale" (EDAS) consisting of 23 items developed by Vefikuluçay and Terzioğlu (11) in order to determine the attitudes of university students toward elders. EDAS consists of three dimensions:

1. Dimension of limitation of the life of elders: beliefs and perceptions of society on the limitations of the social life of elders (items 1, 5, 12, 14, 17, 19, 21, 22, 23),
2. Dimension of positive attitudes toward elders: positive beliefs and perceptions of society about older individuals (items 2, 4, 6, 7, 8, 9, 13, 20),
3. Dimension of negative attitudes toward elders: negative beliefs and perceptions of society about older individuals (items 3, 10, 11, 15, 16, 18).

Answers given to the EDAS used in the research were evaluated according to the total scores given to each item. Items in the scale were evaluated using a 5-point Likert type scale with choices of "strongly disagree," "disagree," "undecided," "agree," and "strongly agree." The total internal consistency coefficient of the scale (Cronbach's) was found to be 0.80. The maximum score a students could receive was 115, and a minimum score was 23." High scores showed that the students had a positive attitude toward elders, and low scores showed negative and discriminatory attitudes toward elders.

If the EDAS score average for the "limitation of the life of elders" was closer to 45, it meant that the student had a positive attitude about the life of elders and did not exhibit discriminatory attitudes. If the EDAS score average was closer to 9 on the same measure, it meant that the student has a negative attitude about elders and expressed discriminatory attitudes. On the next subdimension of the EDAS score—positive attitude toward elders—an average closer to 40 meant that the student did not feel discriminatory toward elders. If this subdimension EDAS score average was closer to 8, it meant that the student has a negative and discriminatory attitude toward elders. Finally, on the third subdimension—negative attitudes toward elders—a score average closer to 30 meant that the student has a positive attitude toward older people, and if the average was closer to 6, it meant that the student held negative and discriminatory attitudes toward elders.

Data Verification

Data were analyzed using the SPSS 17.0 program, and students in the sample group were given frequency and percentage values according to individual characteristics. Views of students on each item of the elder discrimination attitude sca-



Table 1— Scale and Subdimensions for Attitudes Towards Elders.

Scale and Subdimensions	Number of Articles	Cronbach's Alpha	Total Average Score	sd
Limitation of the Life of Elders	9	0.759	35.68	4.70
Positive Attitude toward Elders	8	0.802	31.43	4.94
Negative Attitude toward Elders	6	0.796	16.58	3.28
General Attitude	23	0.805	83.69	4.25

le were given along with the percentage values with arithmetic mean and standard deviation values calculated. Total scores were taken for the evaluation of scale and subscale (dimensions). In the comparison of scale and subscale with the individual characteristics of students, a *t test* (for two groups) and analysis of variance (for three groups or more) were performed.

Factor analysis of the scale was also applied, and the eigenvalue of the scale was over 1. The scale gathered data under three factors that explained 72.4% of the total variance. Barlett's test results showed that factor analysis can be applied (χ^2= 2386.558; p<0.001) and calculated. The Kaiser–Meyer–Olkin value (KMO=0.822) showed that the sampling volume was sufficient.

Results

Among 584 students 37.3% of the students were male and 62.7% were female; 45.1% of students studied Economics, 28.7% studied Public Administration, and 26.2% studied International Relations. On the distribution based on the place students lived the longest, city centers were at the top with 58.4%. Some 81% of the students stated that no elders were living in their houses, and 44.6% of the students stated that the elders in their family live in their own houses with their spouses. Meanwhile, 60.3% of the participants visited elders in nursing homes at some time.

Total average scores for the 23-item scale and its subscales used to determine the participating students' attitudes toward elder discrimination (EDAS) and Cronbach's Alpha values for reliability analyses are given in Table 1. Accordingly, Cronbach's Alpha value is calculated as 0.759 for the first dimension, "limitation of the life of elders," 0.802 for the second dimension, "positive attitudes toward elders," 0.796 for the third dimension, "negative attitudes toward elders," and 0.802 for general attitudes. The average score of students' attitudes in the "limitation of the life of elders" subdimension was calculated as 35.68; average score of students' positive attitudes toward elders subdimension was calculated as 31.43; and the average score of students' negative attitudes subdimension was calculated as 16.58.

Descriptive statistics regarding the 9-item subdimension, "limitation of the life of elders," of the 23-item scale are presented in Table 2. Accordingly, the most positive attitude is shown in these items: "care of elders should not be seen as a financial burden by family members" ($\overline{x}$ =4.23) and "life of elders must be limited to their houses" ($\overline{x}$ =1.64). To the item "life of elders must be limited to their houses," 90% of students answered "strongly disagree" and "disagree." Most negative attitudes of students toward elders showed up in these items: "elderly cannot carry their bags and packages without help" ($\overline{x}$ =3.11) and "elders who lost their spouses should not get remarried" ($\overline{x}$ =2.50).

In the research, descriptive statistics regarding the 8-item subdimension of "positive attitudes toward elders" are presented in Table 3. The most positive attitudes were shown in "priority should be given to elders in queues" ($\overline{x}$ =4.42) and "elders should be cared for by their families they live with" ($\overline{x}$ =4.41). Most negative attitudes were shown in these items: "elders are more patient than younger people" ($\overline{x}$ =3.23) and "elders are more tolerant than younger people" ($\overline{x}$ =3.30). To the item "priority should be given to elders in queues," 88% of the students answered positively with "agree" and "strongly agree."

Descriptive statistics on the 6-item subdimension of "negative attitudes toward elders" are presented in Table 4. The most positive attitude is shown in these items: "the main responsibility of elders is helping their children with household and kitchen chores and in taking care of their grandchildren" ($\overline{x}$ =2.73) and "elders should not go out alone" ($\overline{x}$ =2.86). The most negative attitudes were revealed in these items: "when hiring for a job, younger people should be preferred instead of elders" ($\overline{x}$ =3.72) and "in promotions among individuals in a job, priority should be given to younger people" ($\overline{x}$ = 3.58).

Table 2— Descriptive Statistics for Subdimension of "Limitation of the Life of Elders".

Article Number	Item	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree		
		%	%	%	%	%	$\bar{x}$	sd
1	Life of elders must be limited to their houses	51.5	38.5	5.8	3.1	1.0	1.64	0.81
5	Appearance of elders is repelling	57.4	27.6	7.5	5.1	2.4	1.68	0.98
12	It is unnecessary for elders to buy houses, cars, items, clothing	42.1	36.5	12.5	7.5	1.4	1.90	0.98
14	Elders who lost their spouses should not get remarried again	19.9	26.4	41.6	8.2	3.9	2.50	1.02
17	Elders should be put into nursing homes	52.6	24.1	14.7	6.3	2.2	1.82	1.05
19	In hospitals, instead of elders, priority should be given to younger people	58.4	19.5	11.3	6.7	4.1	1.79	1.14
21	In jobs, elders should be paid less than younger people	34.9	31.3	22.9	7.9	2.9	2.13	1.07
22	Elders cannot carry their bags and packages without help	6.0	23.8	31.8	29.6	8.7	3.11	1.05
23	Care of elders should not be seen as a financial burden by family members	7.5	3.1	8.7	20.5	60.1	4.23	1.20

Table 3— Descriptive Statistics for Subdimension of "Positive Attitudes Toward Elders".

Article Number	Item	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree		
		%	%	%	%	%	$\bar{x}$	sd
2	Elders are more patient than younger people	6.5	20.5	28.3	33.2	11.5	3.23	1.10
4	Priority should be given to elders in queues	5.5	3.1	3.4	19.5	68.5	4.42	1.08
6	Younger people should benefit from the experiences of elders	3.3	3.6	10.6	37.2	45.4	4.18	0.98
7	Elders should be cared about by the families they live with	3.4	2.7	5.0	27.2	61.6	4.41	0.96
8	Elders are loving	1.9	3.1	15.1	46.9	33.0	4.06	0.88
9	When decisions are made in the family, opinions of elders should be taken into consideration	1.9	3.8	15.1	43.7	35.6	4.07	0.91
13	Elders are more tolerant than younger people	6.5	12.5	39.9	26,7	14.4	3.30	1.07
20	When the budget is made in the family, opinions of the elders should be taken into consideration	4.1	7.0	21.4	43.8	23.6	3.76	1.02



Table 4— Descriptive Statistics for Subdimension of "Negative Attitudes Toward Elders".

Article Number	Item	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree		
		%	%	%	%	%	$\bar{x}$	sd
3	Elders get ill all the time	4.8	28.4	31.2	31.7	3.9	3.02	0.98
10	The main responsibility of elders is to help their children with topics such as house and kitchen works and in taking care of their grandchildren	15.9	31.3	25.7	17.6	9.4	2.73	1.20
11	When hiring for a job, younger people should be preferred instead of elders	4.6	7.9	26.5	33.0	27.9	3.72	1.09
15	Elders cannot adapt to changes like younger people	4.5	12.3	28.9	37.2	17.1	3.50	1.05
16	In promotions among individuals in job lives, priority should be given to younger people	4.6	9.2	30.0	35.6	20.5	3.58	1.06
18	Elders should not go out alone	12.3	26.4	30.8	23.6	6.8	2.86	1.12

Views of participants on elder discrimination were compared with their individual characteristics (Table 5), and it was determined that there was no significant difference on the views of students based on gender, department, grade, age, place the student lived the longest, whether elders live at home with them, whether they visit nursing homes ($p>0.05$).

Discussion

This study determined that the attitudes of students were generally positive about elders. It is possible to see this outcome as a natural result of the existence of respect and love toward elders in the society we live in, in our culture, and in our manners and traditions.

Table 5— Comparison of Attitudes of Students Toward Elders as Correlated to Individual Characteristics.

Variable	Group	$\bar{x}$	sd	t/F	P
Gender	Male	3.62	0.41	0.587	0.558
	Female	3.64	0.36		
Department	Economics	3.60	0.37	1.435	0.062
	Public Administration	3.71	0.34		
	International Relations	3.61	0.42		
Grade	1	3.63	0.38	0.583	0.560
	2	3.65	0.38		
The place the student lived the longest	Village	3.66	0.40	0.308	0.819
	Town	3.61	0.38		
	County	3.65	0.39		
	City	3.62	0.37		
Did elders live at home with them	Yes	3.65	0.36	0.545	0.586
	No	3.63	0.38		
Place the elder lives	In their own house with their spouse	3.66	0.39	0.654	0.658
	Alone in their own house	3.58	0.30		
	In their own house with their children	3.65	0.38		
	In their children's house with their children	3.59	0.38		
	Other	3.61	0.43		
Visited nursing home	Yes	3. 62	0.40	0.539	0.590
	No	3.64	0.36		

In studies both foreign (10,12-18) and domestic (4,19,20) university students had a positive attitude toward elders.

The total average score of students in the "limitation of the life of elders" subdimension was calculated as 35.68. This value was closer to the maximum score of 45 (9x5=45), and this shows that students did not feel that elders were limited or should be limited in their lives. The total average score of students for the subdimension of "positive attitudes toward elders" was 31.43. This value was closer to the maximum score of 40, so overall, their attitudes were positive. The total average score for students in the subdimension of "negative attitudes toward elders" was 16.58. This score was below the average of the maximum score of 30 and above the minimum score of 6. This showed that students revealed some discriminatory attitudes toward elders. When it is considered that the maximum score students can obtain from the complete EDAS is 115 and the minimum score is 23, and the total average score was 83.68 (because it is above the average of minimum and maximum that is 69 (115+23)/2=69), the score can be interpreted as positive, although not very positive.

In this study, no differences in elder discrimination were found on the basis of gender. This finding is consistent with the findings of Vefikuluçay (21) and Soyuer et al. (4). However, in our research, females had a more positive attitude toward elders than males. The research shows that in both Turkey and in Western countries, women have a more positive attitude toward elders than men (3,22-24). This situation may show that female students are affected by the traditional role of women in Turkish society as caregivers.

In our study, no significant differences were found on the basis of gender, department, age, or the place the student lived the longest. These result show that the mainstream culture, not subcultures, affect individuals the most.

In this research, although no difference was found between the age of students and their total scores, second-year students have a more positive attitude toward elders than first-year students. As a matter of fact, in other studies, it was found that as the grade increases, students develop a more positive attitude toward elders (13,21,23,24); our research findings support literature. This information shows that education in universities benefits students positively and affects their approaches to elders in a positive way.

Although no significant difference was detected between the situation of elders living together with students and students' total scale scores, the scores of students who lived with elders were found to be higher than the students who did not live with elders. In Turkish culture, respect for elders is an important cultural value. The literature shows that individuals living with their grandmothers and grandfathers have more positive attitudes toward elders (7,11,25). This finding may stem from positive communication with the aged individuals sharing the same house with the students and thus, individuals who live with elders gain a positive perspective on older adults.

One limitation of this study is that it was carried out only with students studying in the Faculty of Economics and Administrative Sciences. Therefore, the present findings cannot be generalized to all university students in Turkey. Future research should include random sampling and increased sample size. The other research results suggest the followings:

- Education programs for increasing the awareness of students about elder discrimination should be prepared,
- Old age and elder discrimination topics should be added to graduate and postgraduate curriculums.

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Melih MALKOÇ
Özgür KORKMAZ
Adnan KARA
İsmail OLTULU
Ali ŞEKER

RESEARCH

RESULTS OF COMBINED CHEVRON OSTEOTOMY AND FIRST PROXIMAL PHALANGEAL CLOSE-UP OSTEOTOMY WITHOUT SOFT TISSUE PROCEDURE WITH SEVERE HALLUX VALGUS IN PATIENTS AGED OVER 60 YEARS OF AGE

ABSTRACT

Introduction: Hallux valgus is associated with a medial deviation of the first metatarsal and subluxation or dislocation of the first metatarsophalangeal joint. This deformity is one of the most common chronic foot complaints, with a prevalence of up to 35.7% in elderly patients. In the present study, we examined 23 feet of 15 patients with severe hallux valgus deformity between April 2008 and December 2013.

Materials and Method: The inclusion criteria were age and severe hallux valgus angle and intermetatarsal angle. Patients who had any other foot deformities, were younger than 60 years, were subjected to inadequate follow-up, had moderate and mild hallux valgus angle and intermetatarsal angle, or underwent any type of prior surgery were excluded from the study.

Results: The mean preoperative hallux valgus angle and intermetatarsal angle were 46.86°(range 45°–51°) and 17.6° (range 13°–21°), respectively. The postoperative corrections achieved by chevron osteotomy and first proximal phalangeal osteotomy for hallux valgus angle and intermetatarsal angle were 21.6° (range 19°–24°) and 12.6° (range 11°–14°), respectively ($p < 0.05$).The mean American Orthopaedic Foot and Ankle Society hallux score improved from 35.8 (range 31–38) to 89.8 (range 87–94) ($p<0.05$).

Conclusion: Although most studies recommend chevron osteotomy only for patients younger than 50 years of age, we did not impose an age limit in our study.

Key Words: Hallux Valgus; Metatarsophalangeal Joint; Osteotomy.

ARAŞTIRMA

ALTMIŞ YAŞ ÜSTÜ İLERİ HALLUKS VALGUS DEFORMİTELİ HASTALARDA YUMUŞAK DOKU CERRAHİSİ YAPILMADAN KOMBİNE CHEVRON VE BİRİNCİ PARMAK PROKSİMAL FALANKS KAPALI KAMA OSTEOTOMİ SONUÇLARI

ÖZ

Giriş: Halluks valgus 1. metatarsın medial deviasyonu sonucunda birinci metatarsofalangeal eklemden subluksasyonu veya dislokasyonu olarak tanımlanır. Yaşlı hastalarda kronik ayak sorunları içerisinde %35,7'nin prevalans gösteren en sık görülen deformitedir. Bu çalışmada Nisan 2008 Aralık 2013 tarihleri arasında ileri halluks valgus deformitesi olan 15 hasta (23 ayak) değerlendirilmiştir.

Gereç ve Yöntem: Çalışmaya dahil edilme kriterleri yaş, ileri halluks valgus açısı ve ileri intermetatarsal açıdır. Altmış yaşın altında olan, takipleri olmayan, diğer ayak deformitesi olan, orta derece halluks valgus açısı ile intermetatarsal açısı olan ve ayak cerrahi hikayesi olan hastalar çalışmaya dahil edilmemiştir.

Bulgular: Ameliyat öncesi hastaların ortalama halluks valgus açısı ve intermetarsal açıları sırasıyla 46,86° (45°-51°) ve 17.6° (13°-21°) olarak belirlenmiştir. Chevron ve 1 parmak proksimal falanks düzeltici osteotomileri sonrasında ortalama halluks valgus açısı ve intermetatarsal açı sırasıyla 21,6° (19°-24°) ve 12.6° (11°–14°) olarak belirlenmiştir. ($p<0,05$). Ortalama Amerikan Ortopedik Ayak ve Ayakbileği skoru 35,8 (31-38) değerinden 89,8 (87-94) değerine yükselmiştir ($p<0,05$).

Sonuç: Çoğu çalışmada Chevron osteotomisi 50 yaş ve altı olan hastalarda önerilmesine rağmen, çalışmamızda yaş sınırlaması yapılmamıştır.

Anahtar Sözcükler: Halluks Valgus, Metatarsofalangeal Eklem, Osteotomi.

Correspondance

Melih MALKOÇ
İstanbul Medipol University, Faculty of Medicine,
Department of Orthopedics and Traumatology, İSTANBUL

Phone: 0212 460 77 77
e-mail: memalkoc@yahoo.com

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İstanbul Medipol University, Faculty of Medicine,
Department of Orthopedics and Traumatology, İSTANBUL

Introduction

Hallux valgus is associated with a medial deviation of the first metatarsal and subluxation or dislocation of the first metatarsophalangeal joint (MTPJ). Pronation of the big toe and lateral shift of the sesamoid complex occur in the later stages of hallux valgus. This foot pathology can be idiopathic or secondary to rheumatoid arthritis (RA), poorly fitted shoes, or connective tissue and neuromuscular pathologies. Hallux valgus is one of the most common chronic foot complaints, with a prevalence of up to 35.7% in the elderly (1).

Conservative treatment using orthotics is usually ineffective, and only surgery leads to satisfactory results. Most surgical procedures for hallux valgus reconstruction require a combination of soft tissue procedures and several types of distal or proximal osteotomies with or without first proximal phalengeal osteotomy.

Surgical treatment of this deformity involves the correction of the alignment with an appropriately chosen metatarsal osteotomy (proximal or distal) and soft tissue releases. In general, distal osteotomies of the first metatarsal are recommended for mild to moderate hallux valgus deformities, whereas more proximal metatarsal osteotomies are suggested for severe deformities. The distal chevron procedure involves performing a V-shaped osteotomy of the distal first metatarsal used to treat mild to moderate hallux valgus deformities. This procedure was first described by Corless in 1976 (2). Lateralization and fixation of the distal fragment result in the narrowing of the forefoot. Thus, distal chevron osteotomy is frequently combined with additional osteotomies and soft tissue procedures to extend its indications to more severe deformities (3). Akin (4) suggested a medial wedge osteotomy of the proximal phalanx of the great toe in combination with a chevron procedure, named as chevron–Akin double osteotomy by Mitchell and Baxter (5). These authors also suggested that chevron–Akin double osteotomy may present several advantages over a single distal chevron procedure.

Akin osteotomy, first described in 1925, involves a medial closing wedge osteotomy and an excision of the medial protruding condylar eminence of the proximal phalanx (6). This procedure has been used to correct residual deformities of the great toe such as valgus deformities, axial rotations, or excessive length, either in isolation or in combination with other procedures. It is also often performed as a final step during the treatment of hallux valgus. In this case, it is used to create a medial deviation of the hallux by repositioning the flexor hallucis longus toward the midline, which can be effective for achieving biomechanical and cosmetic improvements associated with residual hallux valgus deformity (7).

Despite its proven success for treating this type of deformity, chevron osteotomy has been consistently contraindicated for patients older than 50 years. This may be related to the high proportion of patients older than 50 years who report pain and stiffness in MTPJ, leading to decreased overall patient satisfaction in comparison with that in patients younger than this age (8,9).

The present study aimed to retrospectively assess the outcome of chevron osteotomy combined with proximal phalangeal osteotomy used to correct severe hallux valgus deformity in elderly patients.

Materials and Method

This retrospective study was approved by our institution's ethical board, and informed consent was obtained from all patients.

In the present study, we evaluated 23 feet from a total of 15 patients with severe hallux valgus deformity, between April 2008 and December 2013. The inclusion criteria were age and severe hallux valgus angle (HVA) and intermetatarsal angle (IMA). Patients who had any other foot deformities, were younger than 60, were subjected to inadequate follow-up, had moderate and mild HVA and IMA, or underwent any type of prior surgery were excluded from the study. All the measurements were performed using a picture archiving and communication system (IntelliSpace PACS DCX, Release R3.1 L1 SP2 Philips).

The mean age of the patients was 59.8 years for females (range 37–72 years) and 63 years for males (range 62–64 years). The mean follow-up time was 48.6 months (range 35–78 months). Standard weight bearing dorsoplantar and lateral X-ray radiographs (Figures 1 and 2) were obtained preoperatively and at 2, 6, and 12 weeks after the operation. These images were subsequently used to evaluate HVA and IMA (Figures 3 and 4).

HVA was measured as the angle between the intersection of the bisection of the first metatarsal and the proximal phalanx. Normal HVA values range between 10° and 15° (1). IMA was measured as the angle formed by the intersection of the bisection of the first and second metatarsals. Normal IMA values range between 7° and 9°.

All the patients completed an American Orthopaedic Foot and Ankle Society (AOFAS) hallux score questionnaire during the preoperative assessment and during the final follow-up

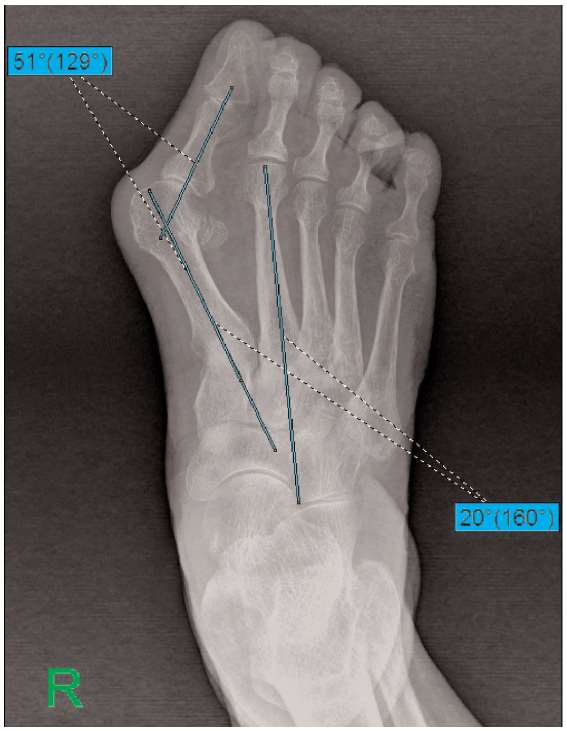


Figure 1— Preoperative antero–posterior weight-bearing x-ray radiography of a 62-year-old woman. Hallux valgus and intermetatarsal angles were 51° and 20°, respectively.

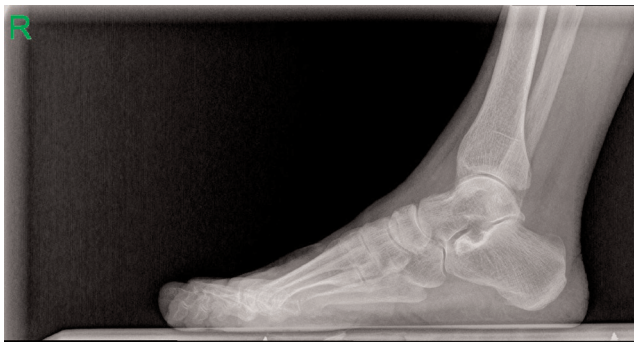


Figure 2— Preoperative lateral weight-bearing x-ray radiography of a 62-year-old woman.



Figure 3— Postoperative antero–posterior x-ray radiography of the same patient. The hallux valgus angle improved by 20° and intermetatarsal angle improved by 13°.



Figure 4— Postoperative lateral x-ray radiography of the same patient.

session. This scoring system consists of three main categories, namely pain, function, and alignment, scored from 0 to 100, with higher scores indicating better functions (10). The pain and function sections were answered by the patient.

All surgical procedures involved a 6-cm longitudinal incision centered in the first carpomethacarpal joint. The capsula was then detached from the metacarp using a reverse U-shape and moved proximally. Subsequently, the bunion was



osteotomised using a 5-mm electrical saw to perform a V-shaped 60° chevron osteotomy of the distal metatarsal. This osteotomy enabled the first metatarsal head to be laterally shifted to correct the abnormal shape caused by a long standing valgus drift. The osteotomy side was fixed using two cross-pinned Kirschner wires. The detached capsule was strongly sutured to the metatarsal to maintain the varus alignment. No intraoperative complications, infections, or fractures were recorded. All surgeries were performed by the same surgeon to avoid surgeon bias.

Partial heel weightbearing using a postoperative shoe was allowed for the first week after surgery. Foot-flat weightbearing to tolerance was allowed between 2 and 6 weeks. After the sixth week, all the patients were advanced to regular shoe wear. The sutures were removed and the pin was pulled on the second week, and each patient began to use a daily elastic compression wrap and a gauze pad between toes one and two.

Preoperative and follow-up postoperative data were compared using a paired Student's t-test at the 95% significance level ($p<0.05$).

RESULTS

The mean preoperative HVA and IMA were 46.86° (range 45°–51°) and 17.6° (range 13°-21°), respectively. Combining chevron osteotomy and first proximal phalangeal osteotomy for HVA and IMA resulted in a postoperative correction of 21.6° (range between 19°–24°) and 12.6° (range between 11°–14°), respectively ($p < 0.05$).

The mean AOFAS hallux score significantly improved from 35.8 (range 31–38) to 89.8 (range 87–94), ($p<0.05$).

Four patients presented with superficial infections after surgery, which were treated with appropriate antibiotic administration. Nonunion, delayed union, or malunion of the osteotomy site was not recorded. No noticeable great toe stiffness was observed.

DISCUSSION

Mobilizing soft tissues during lateral release could potentially lead to damage to the articular surface and disturbance of the blood supply (11). In fact, the most serious complication that could appear following chevron osteotomy is avascular necrosis of the first metatarsal head. The blood supply to the first metatarsal head derives from a nutrient artery in the metatarsal diaphysis and from a second group of vessels entering the metatarsus around the capsule of the first metatarsophalangeal joint (12). Mann (9) and Wilkinson et al. (13) described two types of avascular necrosis caused by osteotomy of the distal end of the metatarsal, partial, and whole-head avascular necrosis. None of the subjects presented with avascular necrosis that was identified clinically or radiologically. These results are similar to those reported by Johnson et al. (14) and Pochatko et al. (15). Compared with chevron osteotomy, chevron–Akin osteotomy may have the advantage of being able to eliminate the need for a lateral capsular release. On the other hand, it has been suggested that adductor tenotomy together with chevron osteotomy devascularizes the metatarsal head and leads to osteonecrosis (16).

After analyzing a series of parameters proposed to evaluate the surgical outcomes of the treatment of hallux valgus (9), previous studies have suggested that chevron osteotomy should only be considered for patients younger than 50 years (9) with an MTP angle <30°, IM angle <15°, and no degenerative changes in MTPJ (9,17). In addition to isolated chevron osteotomy, combined techniques performed with other operative measures are commonly used. Osteotomies of the first ray have been proposed in addition to other soft tissue procedures addressing the lateral capsular complex or the adductor tendon (15,18). Mitchell and Baxter (4) described the procedures to perform Akin osteotomy of the proximal phalanx for treating symptomatic hallux valgus, which may possibly lead to improved functional and radiological results. The authors reported the first results of 24 chevron–Akin double osteotomies performed to correct hallux valgus with a mean follow-up period of 29 months. These patients showed a 95% patient satisfaction with regard to pain and appearance of the foot. Furthermore, Mitchell and Baxter (4) presented excellent radiological results and a low complication rate in similar settings. These authors suggested that combined chevron–Akin osteotomy provides better results that chevron osteotomy alone. Tollison and Baxter (19) also reported good results after a follow-up period of 4 years and 6 months for patients with a mean age of 63 years who underwent chevron–Akin double osteotomy. Our results showed a statistically significant difference between preoperative and postoperative AOFAS scores, radiologic evaluation of HVA, and IMA ($p\leq0.05$). However, in this case, chevron–Akin osteotomy was not restricted to younger patients.

Fixation using Kirschner wires can be inserted without disrupting the delicately corrected position, which is an advantage over other methods; however, this has been highlighted as an insecure method of stabilization (20). Stability can be enhanced by adding transverse Kirschner wires to the

longitudinal Kirschner wires or using multiple longitudinal Kirschner wires. In all these cases, irritation of the soft tissue surrounding the wires is frequent and hardware removal is often necessary (21,22). In our study, the osteotomy side was fixed using two cross-pinned Kirschner wires, and the pins were removed after 2 weeks. No cases of nonunion or instability were reported in our series.

With regard to postoperative treatment, most authors allow full weightbearing using a stiff-soled shoe or a cast during the first 2 weeks after surgery, while others only allow heel weightbearing throughout the same period (23,24). The patients in our study were allowed partial heel weightbearing using a postoperative shoe for the first week after surgery and foot-flat weightbearing to tolerance between two and six weeks. We did not detect any loss of correction or pain during the follow-up period.

Stiffness and pain on the first MTPJ can occur after bunion procedures. Mann and Coughlin (9) believed that the incidence is higher after a chevron procedure in patients older than 50 years; however, our results did not show a significant increase in stiffness or pain.

Previous studies have also suggested that AOFAS scores may be inadequate to assess clinical outcomes after surgical correction of hallux valgus (11,25). The major limitations of our study are a short follow-up period and the fact that this is a retrospective study designed to evaluate AOFAS scores associated with chevron–Akin osteotomy results.

In conclusion, most authors recommend chevron osteotomy only for patients younger than 50 years; however, we did not impose an age limit in our study. We only reviewed patients older than 60 years and found no evidence to support the age limitation currently placed on chevron procedures. Chevron osteotomy is the main procedure used to correct hallux valgus and metatarsus primus varus. Akin osteotomy helps align and derotate the toe without relying on extreme capsular imbrication. Thus, this procedure may help reduce the pressure on MTPJ, thereby reducing the incidence of postoperative pain and stiffness.

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Tarık TUNCAY[1]
Veli DUYAN[2]

RESEARCH

TURKISH ADAPTATION OF THE GERIATRIC SOCIAL WORK COMPETENCY SCALE IN A GROUP OF SOCIAL WORK BACHELOR STUDENTS

ABSTRACT

Introduction: This study aimed to examine the validity and reliability of the Geriatric Social Work Competency Scale (GSWCS) in a group of social work bachelor students.

Materials and Method: To examine the validity and reliability of the scale, a Turkish version of the form was administered to 196 senior students from social work bachelor programs at Adnan Menderes, Ankara, Hacettepe, and Selçuk Universities. Of the randomly selected sample, 108 students (55.1%) were women and 88 (44.9%) were men, and their mean age was 23.24 years (standard deviation 1.66; range: 21-31 years).

Results: Cronbach's alpha showed an internal consistency of 0.885 for the values subscale, 0.889 for the assessment subscale, 0.900 for the intervention subscale, 0.929 for the service subscale, and 0.966 overall. Principal component analysis was applied to examine the validity of the scale, and uncovered "values," "assessment," "intervention," and "service" as the four dimensions, explaining 45.067%, 56.352%, 53.252%, and 61.238% of the total variability, respectively. The total variability explained by all four dimensions was 59.27%.

Conclusion: The current study with a group of social work bachelor students showed that GSWCS was a valid and reliable scale for the Turkish population.

Key Words: Social Work; Aging; Reproducibility of Results.

ARAŞTIRMA

GERİATRİK SOSYAL HİZMET YETKİNLİK ÖLÇEĞİ'NİN BİR GRUP SOSYAL HİZMET LİSANS ÖĞRENCİSİ ÜZERİNDE TÜRKÇE UYARLAMA ÇALIŞMASI

ÖZ

Giriş: Bu çalışma Geriatrik Sosyal Hizmet Yetkinlik Ölçeği'nin geçerliğini ve güvenirliğini bir grup sosyal hizmet lisans öğrencisi üzerinde incelemeyi amaçlamaktadır.

Gereç ve Yöntem: Ölçeğin güvenirliği ve geçerliğinin belirlenmesi için Türkçe formu, Adnan Menderes, Ankara, Hacettepe ve Selçuk üniversiteleri sosyal hizmet bölümlerinin son sınıfta okuyan 196 öğrenciye uygulandı. Araştırma kapsamına evrenden seçkisiz olarak alınan son sınıf öğrencilerinin 108'i (%55,1) kadın, 88'i (%44,9) erkektir. Öğrencilerin yaş ortalaması 23,24 (1,6) olup, yaşları 21 ile 31 arasında değişmektedir.

Bulgular: Yüz doksan altı üniversite öğrencisi üzerinde uygulanan ölçeğin Cronbach Alpha güvenirlik değeri değerler alt ölçeği için 0,885, değerlendirme alt ölçeği için 0,889, müdahale alt ölçeği için 0,900, hizmet alt ölçeği için 0,929 ve geriatrik sosyal hizmet yetkinlik ölçeğinin tamamı için 0,966 olarak belirlendi. Geçerlik için yapılan temel bileşenler analizi sonuçları, ölçeğin dört boyutu olduğunu; değerlerle, değerlendirmeyle, müdahaleyle ve hizmetle ilgili faktöre ait toplam değişkenliği açıklama yüzdesi sırasıyla %45,067, %56,352, %53,252, %61,238 ve toplamda %59,27 olduğunu göstermektedir.

Sonuç: Bir grup üniversite öğrencisi ile yapılan bu çalışma Geriatrik Sosyal Hizmet Yetkinlik Ölçeği'nin Türk toplumu geçerli ve güvenilir olduğunu ortaya koymaktadır.

Anahtar Sözcükler: Geriatrik Sosyal Hizmet; Yetkinlik; Yaşlılık; Geçerlik; Güvenirlik.

Correspondance

Tarık TUNCAY
Hacettepe University, Faculty of Economics & Administrative Sciences, Department of Social Work, ANKARA

Phone: 0505 649 39 24
e-mail: tariktuncay@gmail.com

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[1] Hacettepe University, Faculty of Economics & Administrative Sciences, Department of Social Work, ANKARA
[2] Ankara University, Faculty of Health Sciences, Department of Social Work, ANKARA



INTRODUCTION

By the mid-21st century, one in five persons are expected to be over 65 years old, creating a shift in demand for social work to the elderly and their families. However, the need for geriatric social workers goes beyond meeting this demographic imperative. Although many professions are called to respond to the growing aging population, the demand for social workers with gerontological knowledge is grounded in the conviction that the profession's values, theoretical perspectives, and skills are essential for enhancing the well-being of older adults and their families (1). The growing number of elderly patients with chronic disabling illnesses, and the increasing need for rehabilitative services to support independent functioning, means that patients and families alike will require more psychological and social assistance to manage their problems effectively. Therefore, the goal of health care for the older adult is not only to provide medicine and nursing, but also to focus on how the older person can manage his or her health while maintaining a high quality of life.

Social workers and other health care professionals with knowledge of the aging process will become ever more essential to addressing the complex needs of older people and their families. Social work in this domain is professionally responsible for key interventions (2) that:

- Enhance the developmental, problem solving, and coping capacities of older people and their families;
- Promote the effective and humane operating of systems that provide resources and services to older people and their families;
- Link older people with systems that provide them with resources, services, and other opportunities;

This encompasses direct practice with older adults and their families, together with macro interventions through specific programs and policies (3). The social work perspective is oriented toward family, social, and community-based models of care and welfare policy.

The Rising Need for Geriatric Competency in Social Services and Social Work Education

Competency-based education (CBE) is an approach for producing a skilled workforce and ensuring that graduates can perform expected behaviors at a professionally acceptable level (4). The lack of social workers with the specialized knowledge and skills necessary to meet the needs of a rapidly growing aging population is well documented (5,6), and the need for competence in geriatric knowledge and skills is not limited to those social workers who practice exclusively with the elderly (i.e., in elderly counseling centers and rest homes), but applies equally to the majority of social workers. The lack of social workers qualified to work with older adults is actually related, in a large part, to the lack of commonly accepted competencies for geriatric social work practice. Established geriatric social work competencies could shape field training and graduate education programs to prepare practitioners to address the bio-psychosocial needs of an ever-increasing population of elderly clients and their families. Qualified social workers must therefore demonstrate competence in working with individuals and families over a sustained period in an area of particular practice within the relevant legal and organizational framework, as well as the ability to transfer knowledge and skills from one situation to another, irrespective of the case, need, problem, or context (7).

Development of Geriatric Social Work Competencies

The rise in CBE in social work has been attributed to the recognized need for public accountability by leaders within the profession (8). Competency-based approaches provide a transparent blueprint of what students can expect to learn, what teachers will ensure is provided, and what practitioners have a responsibility to master (9). As a direct consequence of CBE, social work researchers and educators have developed strategies for assessing student learning through internships, as a means of assessing learning needs and readiness for practice. However, scant literature was available on the topic of geriatric social work competencies until the start of this century.

The Hartford Partnership Program in Aging Education of the New York Academy of Medicine developed the first version of the Geriatric Social Work Competency Scale (GSWCS) to measure the outcomes of aging-enhanced social work education (1); a focus group of providers and older persons identified a set of core competencies (10). The resulting GSWCS was a 58-item instrument divided into five domains. In the next phase, the GSWCS was developed by Damron-Rodriguez to eliminate double-barreled, and redundant items, and to lessen the time for administration (11). The revised scale contained 40 items grouped into four domains: 1) Values, ethics, and theoretical perspectives; 2) Assessment; 3) Intervention; and 4) Aging services, programs, and policies.

The final version of the scale measured the respondents' perceptions of their skill levels (e.g., self-efficacy) in practice

using a 0-4 item Likert scale (0 = not skilled at all; 4 = expert skill). The scale has been successfully applied in the classroom as learning objectives, and measured in field education as learning outcomes (12,13). The instrument has considerable face validity and has been useful in assessing a range of skill levels along the continuum of both bachelor and graduate levels of social work education (14).

The purpose of this study was to examine the validity and reliability of the GSWCS with a group of social work bachelor students in Turkey.

Materials and Method

Participants

We recruited 196 final-year students who agreed to participate in the study from social work bachelor programs of Adnan Menderes, Ankara, Hacettepe, and Selçuk universities. To be included, participants were required to be in the final year of social work education and to have volunteered. A Turkish version of the scale was administered to the students, who were informed about the study and asked to sign an informed consent form prior to its start. The study was approved by the Research Ethics Board of Ankara University.

GSWCS

The GSWCS, developed by Damron-Rodriguez (11), includes 40 items across 4 domains of 10 items each, covering (a) values, ethics, and theory; (b) assessment; (c) intervention; and (d) aging services, programs, and policies. Individual items are rated according to a five-point Likert scale (0 = not skilled at all; 4 = expert skill). The scale can be self-administered by the student, administered by the field instructor, or completed by both the student and the instructor for comparison. The instrument is reported to have strong face validity (15). Recent data from nearly 500 social work students indicates that the instrument has high reliability (16).

Data Analysis

All analyses were conducted using IBM SPSS Statistics for Windows, Version 20.0. Variables were expressed as arithmetic means (X) and standard deviations (SDs). The minimum significance level was set at $p<0.05$. Construct validity was evaluated by principal component analysis and factor analysis. The Cronbach's alpha was used to measure internal consistency, specifically the degree to which an item related to the domain and the overall measurement of geriatric social work competency as defined by the scale as a whole. Spearman's rank correlation coefficient was used to assess the item scores with the scores of the total scale by measuring how well the relationship between the four factors of the scale could be described using a monotonic function. We also conducted a language equivalence study in which item correlations were controlled by the researchers. The Pearson correlation between composite scores of the Turkish form and the English form were calculated. Confirmatory factor analysis (CFA) and explanatory factor analysis (EFA) were used for the structure validity of the scale.

Table 1— Reliability Analysis for the GSWCS.

Subscales	Number of Items	Cronbach's Alpha
Values	10	0.885
Assessment	10	0.889
Intervention	10	0.900
Service	10	0.929
Total	40	0.966

Results

We included 196 senior students with an average age of 23.24±1.66 years (range=21–31), of which 88 (44.9%) were women and 108 (55.1%) were men.

Reliability

The Cronbach alpha coefficient of the GSWCS was 0.885 for the values subscale, 0.889 for the assessment subscale, 0.900 for the intervention subscale, 0.929 for the service subscale, and 0.966 overall. This indicated a higher internal consistency than was expected (Table 1).

Item-test correlations and factor analyses of the GSWCS are summarized in Table 2. Item-test correlations ranged from 0.426 to 0.675 for the values domain, 0.434 to 0.739 for the assessment domain, 0.617 to 0.715 for the intervention domain, and 0.620 to 0.768 for the services domain, which were strong. CFA was carried out for all of the items of the scale, and because the goodness-of-fit indices were satisfactory, we accepted the reliability of latent factors (i.e., sub-questions).

Validity

Five academic social workers with excellent Turkish and English language skills translated the scale from English to



Table 2— Item-test Correlations and Factor Analyses of the GSWCS.

Items	Rs	Factor Loadings
I. Values, Ethics, and Theoretical Perspectives		
1. Assess and address values and biases regarding aging.	0.503	0.586
2. Respect and promote older adult clients' right to dignity and self-determination.	0.574	0.626
3. Apply ethical principles to decisions on behalf of all older clients with special attention to those who have limited decisional capacity.	0.562	0.591
4. Respect diversity among older adult clients, families, and professionals.	0.426	0.736
5. Address the cultural, spiritual, and ethnic values and beliefs of older adults and families.	0.510	0.661
6. Relate concepts and theories of aging to social work practice.	0.603	0.489
7. Relate social work perspectives and related theories to practice with older adults.	0.640	0.626
8. Identify issues related to losses, changes, and transitions over their life cycle in designing interventions.	0.663	0.689
9. Support persons and families dealing with end-of-life issues related to dying, death, and bereavement.	0.675	0.574
10. Understand the perspective and values of social work in relation to working effectively with other disciplines in geriatric interdisciplinary practice.	0.674	0.676
II. Assessment		
1. Use empathy and sensitive interviewing skills to engage older clients in identifying their strengths and problems.	0.679	0.630
2. Adapt interviewing methods to potential sensory, language, and cognitive limitations of the older adult.	0.725	0.644
3. Conduct a comprehensive geriatric assessment (biopsychosocial evaluation).	0.434	0.296
4. Ascertain health status and assess physical functioning of older clients.	0.709	0.610
5. Assess cognitive functioning and mental health status of older clients.	0.683	0.603
6. Assess social functioning and social support of older clients.	0.739	0.695
7. Assess caregivers' needs and level of stress.	0.649	0.595
8. Administer and interpret standardized assessment and diagnostic tools that are appropriate for use with older adults.	0.579	0.574
9. Develop clear, timely, and appropriate service plans with measurable objectives for older adults.	0.727	0.686
10. Reevaluate and adjust service plans for older adults on a continuing basis.	0.734	0.664
III. Intervention		
1. Establish rapport and maintain an effective working relationship with older adults and family members.	0.617	0.567
2. Enhance the coping capacities and mental health of older persons through a variety of therapy modalities.	0.650	0.719
3. Utilize group interventions with older adults and their families.	0.698	0.660
4. Mediate situations with angry or hostile older adults and/or family members.	0.645	0.608
5. Assist caregivers to reduce their stress levels and maintain their own mental and physical health.	0.699	0.554
6. Provide social work case management to link elders and their families to resources and services.	0.663	0.621
7. Use educational strategies to provide older persons and their families with information related to wellness and disease management.	0.626	0.501
8. Apply skills in termination in work with older adults and their families.	0.695	0.574
9. Advocate on behalf of clients with agencies and other professionals to help elders obtain quality services.	0.715	0.630
10. Adhere to laws and public policies related to older adults.	0.678	0.669
IV. Aging Services, Programs, and Policies		
1. Provide outreach to older adults and their families to ensure appropriate use of the service continuum.	0.691	0.655
2. Adapt organizational policy, procedures, and resources to facilitate the provision of services to diverse older adults and their family caregivers.	0.643	0.686
3. Identify and develop strategies to address service gaps, fragmentation, discrimination, and barriers that impact older persons.	0.636	0.662
4. Include older adults in planning and designing programs.	0.623	0.648
5. Develop program budgets that take into account diverse sources of financial support for the older population.	0.620	0.562
6. Evaluate the effectiveness of practice and programs in achieving intended outcomes for older adults.	0.685	0.620

(Continued)

Table 2— Item-test Correlations and Factor Analyses of the GSWCS. *(Continued)*

Items	Rs	Factor Loadings
7. Apply evaluation and research findings to improve practice and program outcomes.	0.683	0.597
8. Advocate and organize with the service providers, community organizations, policymakers, and the public to meet the needs and issues of a growing aging population.	0.768	0.729
9. Identify the availability of resources and resource systems for older adults and their families.	0.658	0.610
10. Assess and address any negative impacts of social and health care policies on practice with historically disadvantaged populations.	0.635	0.697

Rs: Spearman's rank correlation coefficient.

Turkish and assessed the language validity of the scale. The original English and the Turkish translation were distributed to two groups of final-year students (20 per group) of the English Language and Literature Department. One group retranslated the English text into Turkish and the other group back-translated the scale from Turkish to English. The correlation between translations was 0.94 (p=0.000).

Factor Analysis Procedure

To determine the number of factors in the GSWCS, EFA was conducted on data obtained from the scale. Bartlett's test of sphericity was used to assess the requirement for factor analysis. The probability associated with Bartlett's test of sphericity was less than 0.00, indicating that the correlations in the inter-correlation matrix were significantly different from zero. The data analyzed for this research showed that Bartlett's test (X^2: 4061.233; p: 0.000) was suitable for the factor analysis. After determining whether EFA was appropriate, EFA of principal component analysis was used (Table 3). The total variance explained the eigenvalues associated with each factor (linear components). Eigenvalues in the values, ethics, and theoretical perspectives, the assessment, the intervention, and the aging services, programs, and policies dimensions were 18.027, 5.635, 5.325, and 6.124, respectively; the total variances explained for the four dimensions were 45.067, 56.352, 53.252, and 61.238, respectively. These findings show the essential four-dimensional structure of the GSWCS.

CFA (intercorrelation matrix with 40 items) was used to test the four-dimensional structure of the GSWCS derived from EFA. Goodness-of-fit indices for the GSWCS are depicted in Table 4, and show that the data is compatible with the four-dimensional model.

CFA was conducted using LISREL 8.7 (Scientific Software International, Inc., Lincolnwood, IL, USA) with covariance matrices serving as the input; solutions were generated based on the maximum likelihood. According to CFA, the X^2/SD rate was 2.31, and all indices (RMSEA = 0.052, RMR = 0.057, CFI = 0.97, GFI = 0.92, AGFI = 0.90, NFI = 0.94, and NNFI = 0.97) had an acceptable fit between the four-dimensional model and the observed data. A diagram of the four-dimensional model is shown in Figure 1. Coefficients of the observed data were between 0.29 and 0.78. According to these results, the four-dimensional structure of the GSWCS was validated.

Table 3— Principal Component Analysis Examining the Validity of the GSWCS.

Factors	Eigenvalue	Total Variance Explained %
Values	18.027	45.067
Assessment	5.635	56.352
Intervention	5.325	53.252
Service	6.124	61.238
Total	Bartlett X^2= 4061.233	p = 0.000

Table 4— Goodness-of-Fit Indices for the GSWCS.

Goodness-of-Fit Indices	Value
X^2/sd (1701.56/734)	2.31
GFI	0.92
AGFI	0.90
CFI	0.97
NFI	0.94
NNFI	0.97
RMR	0.057
RMSEA	0.052

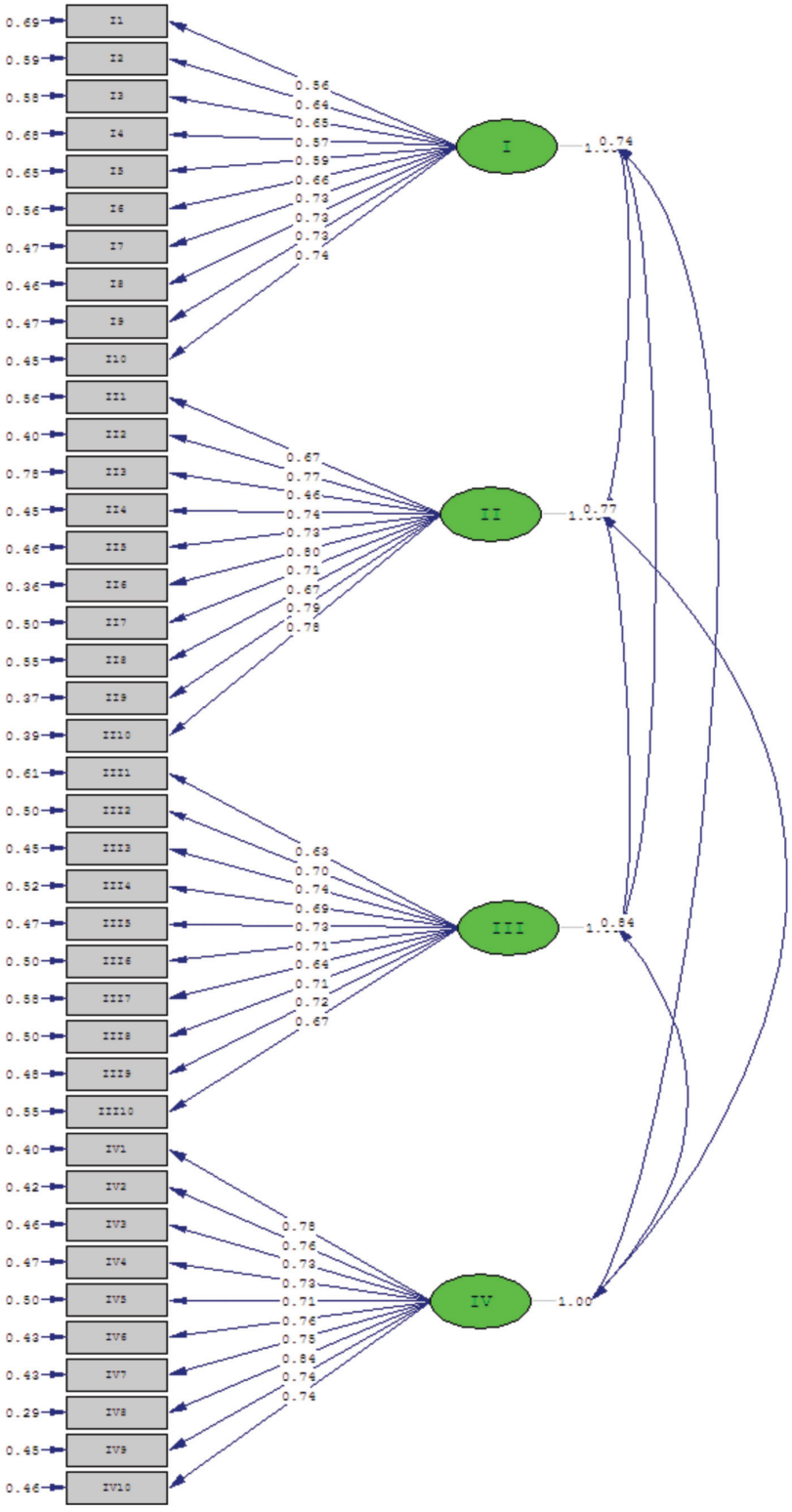


Figure 1— Path Diagram of Four-Dimensional Model (Standardized).

Discussion

In health and social care provision, there is growing recognition that competencies need to be developed that are age-appropriate and effective for meeting the needs of specific populations, such as older clients and their families. In health care organizations that employ a significant number of social workers, staff competence (i.e., knowledge and skills) in delivering age-appropriate services is considered a primary indicator of organizational quality and a key to obtaining accreditation (10).

Competence needs to be measured to demonstrate the effectiveness of both education and, more importantly, interventions in improving the lives of older people. For example, geriatric social work practice has been found to be effective in reducing the risk of institutionalization and caregiver burden, minimizing risk factors through multidisciplinary home evaluations, and improving care through geriatric clinical care management (11,12,17,18).

The current study examined the validity and reliability of a Turkish adaptation of the GSWCS among social work bachelor students from four universities. All of the reliability coefficients of the scale, measured by Cronbach's alpha, indicated high internal consistency. The consistency coefficients of the GSWCS, including the subscales, were also satisfactory, and item-test correlations were strong. Both the CFA for the items in the four-dimensional structure of the GSWCS and the goodness-of-fit indices were in the expected range. Because the goodness-of-fit indices were in the expected range, latent factors were accepted for the sub-questions. The language equivalence of the scale by Pearson correlation coefficient was 0.94 (p=0.001). CFA and EFA were both used to assess the structure validity of the scale. Explanatory variance analysis revealed that they explained 26.34% of the total variance.

We were not able to identify any studies that have assessed the validity and reliability of the English or Turkish versions of the GSWCS for social work students in the published literature. Indeed, this appears to be the first study to include final-year social work students. Based on our results, the 40-item GSWCS is a valid and reliable scale. However, an important limitation of the study needs to be addressed. Specifically, we only recruited social work bachelor students in the study, and generalizability limitation caused by use of only undergraduate social work students as respondents. Future research should incorporate graduate students at both master's and doctorate levels to extend the validity of the results.

This study has important implications for social work educators wanting to capture distinct aspects of student competencies in age-related practice. For example, the core assessment and intervention subscales could be employed to measure confidence with fundamental practice in geriatric settings after graduation from social work bachelor and/or master's programs. This would enable the faculty to determine whether students had acquired a basic level of confidence in working with older adults across the spectrum of health and social care settings. Similarly, faculty graduate programs could use the specialized assessment and intervention subscales to assess self-efficacy among master's students graduating with geriatric settings.

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Ebru ÇALIK KÜTÜKCÜ[1]
Hülya ARIKAN[1]
Melda SAĞLAM[1]
Naciye VARDAR YAĞLI[1]
Çiğdem ÖKSÜZ[2]
Deniz İNAL İNCE[1]
Sema SAVCI[3]
Tülin DÜGER[1]
Lütfi ÇÖPLÜ[4]

Correspondance

Ebru ÇALIK KÜTÜKCÜ
Hacettepe University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, ANKARA

Phone: 0312 305 25 25
e-mail: ebrucalk85@hotmail.com

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[1] Hacettepe University, Faculty of Health Sciences, Department of Physical Therapy and Rehabilitation, ANKARA
[2] Hacettepe University, Faculty of Health Sciences, Department of Occupational Therapy, ANKARA
[3] Dokuz Eylül University, Vocational School of Physical Therapy and Rehabilitation, İZMİR
[4] Hacettepe University, Faculty of Medicine, Department of Chest Diseases, ANKARA

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.

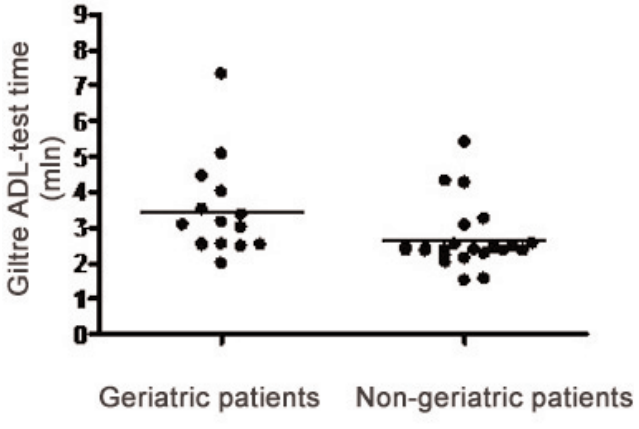


Figure 1— The difference in the Glittre ADL Test time between the geriatric and non-geriatric patients with COPD.

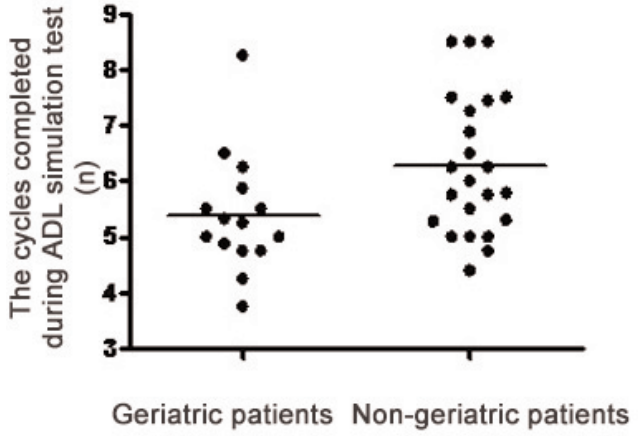


Figure 2— The difference in the cycles completed during the ADL Simulation Test between the geriatric and non-geriatric patients with COPD.

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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İsmail ŞENER[1]
M. Ali ASLAN[2]
Mustafa TEK[3]
Cihan BEREKET[1]
Selim ARICI[4]
Shuichi SATO[5]

RESEARCH

THE EFFECT OF IMPLANT THERAPY ON MAXIMUM BITE FORCE IN EDENTULOUS ELDERLY PATIENTS: AN IN VIVO STUDY

ABSTRACT

Introduction: The purpose of the present study was to compare the bite force differences between conventional complete denture prostheses and implant retained overdentures.

Materials and Method: The study group consisted of 15 complete denture patients. Three months after insertion of conventional dentures, the first bite force measurements were made with a Dental Prescale sheet (Fuji Film, Tokyo). After 5 and 7 weeks, two implants were placed in the mandibular symphysis region. Three months after implant surgery, implant retained overdentures were fabricated. Three months after the insertion of implant retained overdentures, a second set of bite force measurements was made and the values were recorded. Bite forces were compared between conventional complete dentures and implant retained overdentures and the chewing satisfaction obtained from patients in both groups was measured using visual analogue scale. All results were evaluated statistically using a paired t-test and values of $p<0.05$ were considered as statistically significant.

Results: Bite forces and chewing satisfaction increased in all patients after the implant retained overdenture insertion. The mean bite force values before and after implant therapy were found 194.03±95.08 Newton and 302.91±119.84 Newton respectively. According to the paired t-test, a statistically significant difference were found in bite forces and chewing satisfaction before and after implant therapy ($p<0.05$).

Conclusions: The present study showed increased bite forces and chewing satisfaction after insertion of implant retained overdentures.

Key Words: Denture, Overlay; Bite Force; Dental Implants.

ARAŞTIRMA

DİŞSİZ YAŞLI HASTALARDA İMPLANT TEDAVİSİNİN MAKSİMUM ISIRMA KUVVETİ ÜZERİNE ETKİSİ

ÖZ

Giriş: Bu çalışmanın amacı, implant destekli tam protez ile konvansiyonel tam protezler arasındaki ısırma kuvvetleri farklılıklarının karşılaştırılmasıdır.

Gereç ve Yöntem: Çalışmaya 15 dişsiz hasta dahil edildi. Konvansiyonel protez yapıldıktan 3 ay sonra, Dental Prescale (Fuji Film, Tokyo) kullanarak ilk ısırma kuvvet kayıtları alındı. 5 ila 7 hafta sonra alt çene simfiz bölgesine iki adet implant yerleştirildi. Implant cerrahisinden üç ay sonra, implant destekli protezler yapıldı. Bu protezler üç ay kullandırıldıktan sonra ikinci ısırma kuvvet kayıtları alındı ve değerler kaydedildi. İmplant destekli ve konvansiyonel tam protezler arasındaki ısırma kuvvetleri ile, her iki gruptaki hastalardan visual analog skala kullanılarak elde edilen çiğneme memnuniyeti karşılaştırıldı. Tüm sonuçlar eşleştirilmiş t-testi ile değerlendirildi ve p'nin 0.05 değerinden küçük olması istatistiksel olarak anlamlı olarak kabul edildi.

Bulgular: İmplant yerleştirilmesi sonrası tüm hastalarda ısırma kuvveti ve çiğneme memnuniyeti arttı. İmplant öncesi ve sonrası ortalama ısırma kuvveti sırasıyla 194,03±95.08 Newton ve 302.91±119,84 Newton bulundu. Eşleştirilmiş t-testi'ne göre implant öncesi ve sonrası ısırma kuvveti ve çiğneme memnuniyeti açısından anlamlı fark bulundu ($p<0,05$).

Sonuç: Bu çalışma implant destekli protez sonrası ısırma kuvvetinin ve çiğneme memnuniyetinin arttığını gösterdi.

Anahtar Sözcükler: Mandibular Dişsizlik; Maksimum Isırma Kuvveti; Dental İmplant.

Correspondance

İsmail ŞENER
Ondokuz Mayıs University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Samsun, TURKEY

Phone: 0362 312 19 19
e-mail: isener@hotmail.com

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[1] Ondokuz Mayıs University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery, Samsun, TURKEY
[2] Abant İzzet Baysal University, Faculty of Dentistry, Department of Prosthodontics, Bolu, TURKEY
[3] Abant İzzet Baysal University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgey, Bolu, TURKEY
[4] Ondokuz Mayıs University, Faculty of Dentistry, Department of Orthodontics, Samsun, TURKEY
[5] Tohoku University School of Dentistry, Department of Oral and Maxillofacial Surgery, Sendai, JAPAN

Introduction

Although complete denture prosthesis is a widely used prosthodontic treatment option in dentistry, oral rehabilitation using a conventional complete denture, even if it is correctly executed, may not fully resolve the functional and psychological problems of edentulous patients. Complete denture wearers often complain about reduced bite force, mobility, retention-stability problems and pain (1). In addition, masticatory performance, treatment success, patient satisfaction, and oral health-related quality of life are important factors in prosthodontic treatment (2,3).

According to Fontijn-Tekamp (1), the reasons for decreased bite forces are multifactorial: they include individual muscle force, degree of mouth opening, tilting of the denture, and pain in the denture-bearing tissues. When pain limits oral functions, the extra degree of support for mandibular dentures afforded by dental implants could be important for improving oral function (1,4-5). For this reason, implant retained mandibular overdenture treatment has been a successful treatment modality in this group of patients and implant retained overdentures have been increasingly accepted as an alternative to conventional dentures for the oral rehabilitation of edentulous patients (6,7).

Stabilizing the denture by means of osseointegrated implants has been found to enhance masticatory performance (8-10). This finding has been reinforced by studies that compared patients' perceptions of function related to mastication with conventional and implant retained overdentures (11,12). According to a previous study, increases in masticatory efficiency can be obtained about 6 weeks after insertion of the new complete dentures (13).

Improvement of oral function after implant treatment was also demonstrated by objective methods. The maximum bite force of subjects with mandibular overdentures supported by implants was 60–200% higher than that of subjects with conventional dentures (14,15). A previous study reported that implant type and attachment systems for mandibular implant retained overdentures were found to have no effect on masticatory performance (16).

Many studies have evaluated the masticatory performance of conventional complete denture prostheses versus implant retained overdentures (17-19). Some research has shown that objective masticatory performance significantly improved after implant treatment (20,21). Investigators have suggested that occlusal contact area, occlusal pressure and bite force could be useful in understanding masticatory performance in patients (22). When the related literature was evaluated, it was found that different researchers used different devices for evaluating masticatory performance (5). Recently, Miyaura et al. (23) used a pressure detecting sheet in an epidemiological study to evaluate the bite abilities of individual patients (bite pressure, bite force and occlusal contact area).

The purpose of the present study was to compare bite force and chewing satisfaction differences in patients with conventional complete denture prostheses and then with implant retained overdentures. The research null hypothesis was that implant retained overdentures do not improve the bite force and chewing satisfaction when compared with conventional complete dentures.

Materials and Method

The study group consisted of 15 complete denture patients (10 males and 5 females; age range 55-80 years, mean age 66.4±8.7) that applied to Ondokuz Mayıs University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery and Prosthodontics. All participants received oral and written information about the trial before giving their written and informed consent to participate. This clinical trial was approved by the local ethical review board. First, a set of conventional complete dentures was prepared for each patient by the same prosthodontist. Three months after insertion of the conventional dentures, the first bite force values were recorded with a Dental Prescale sheet (Fuji Film Co, Tokyo, Japan) (Fig 1). Five to 7 weeks later, two implants were placed into the mandibular symphysis region for each patient (3.8 mm diameter and 10.5 mm length, BioHorizons®, Birmingham, USA). All surgical procedures were performed under local anesthesia by the same surgeon. Ten days after implant surgery the sutures were removed and complete dentures were adjusted by applying a soft relining material (Ufi Gel P, Voco GmbH, Germany). Two weeks after implant placement, patients started to use the dentures.

Three months from the time of implant surgery, the complete dentures that had been adjusted by applying soft relining material were removed and new implant retained complete overdentures with two ball attachments were fabricated. Three months after insertion of the implant retained complete overdentures, second bite force values were recorded. All the procedures such as application of soft relining material, insertion of the first set of complete dentures and, after the implant surgery, insertion of the second set of complete dentures, and all bite force records were completed by the



Figure 1— Pressure sensitive sheet (Dental Prescale).

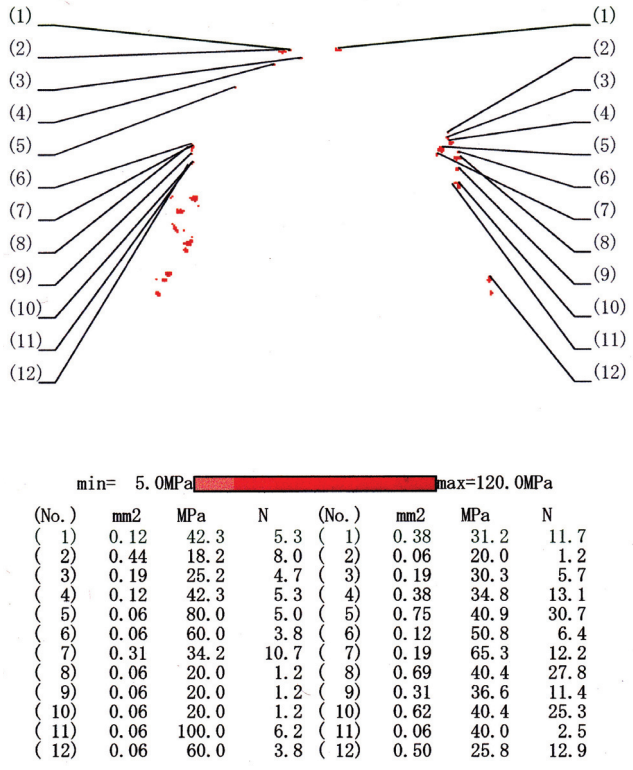


Figure 2— Example of the form of analysis of occlusal contact area (mm2), occlusal pressure (MPa) and bite force (N)

same prosthodontist. All information collected from the patients' records was blinded by numbering it from 1 to 30. The occlusal pressure records were then sent to another investigator to calculate the bite force using the Dental Prescale Occluzer System (Fuji Film Co, Tokyo, Japan).

Bite force was measured as described by Sato et al. (24). Records were taken with subjects seated upright, looking forward, and with an unsupported natural head position. The Dental Prescale sheet was positioned on the teeth by the prosthodontist and the subject was instructed to bite as forcefully as possible. Before positioning the sheet, all the patients were trained to bite down in the maximum intercuspal position by the same prosthodontist.

The Dental Prescale consists of two paper sheets with numerous microcapsules containing a red dye between them. When the teeth are brought into occlusion, these microcapsules rupture and discharge the dye, staining one of the papers red. The density of the color is in proportion to the degree of pressure applied (24). Bite force and occlusal contact area were calculated from the degree of coloring. Tooth contact area and the density of the color for the occlusal pressure recorded on the Dental Prescale sheet were measured by an Occluzer; the bite force was also calculated using this apparatus. The occlusal contacts were detected by this chemical reaction and scanned by the occlusion pressure graph (Figure 2). The mean bite force values before and after implant therapy are listed in Table 1.

Chewing satisfaction of all patients was measured using visual analogue scale (VAS). Before both bite registration, patients marked the level of their chewing efficiency on a 100 mm, non-hatched visual analogue scale. According to this scale, the level of chewing efficiency was documented in the range of 0–10 numerically and verbally as no chewing (0), low chewing satisfaction (1-3), moderate chewing satisfaction (4-6) and high chewing satisfaction (7-10).

Table 1— Mean Bite Force (Newton) of Patients Before and After Implant Therapy.

	Before	After
Bite Force	194.03[a] ± 95.08	302.91[b] ± 119.84

*Values having same letters were not significantly different for Student t test (p>0.05)

With in each group, values were averaged. In this study, all the data were transferred to SPSS software (release 12.0; SPSS, Chicago, Ill) for analysis. The Kolmogorov-Simirnov test showed that the data had a normal distribution ($p>0.05$).

Results

Biting force and chewing satisfaction increased in all patients after the implant retained overdentures were inserted. The mean bite force values before and after implant therapy were found 194.03±95.08 Newton (N) and 302.91±119.84 N respectively. Bite force values before and after implant therapy are listed in Table 1. According to the paired t-test, a statistically significant difference was found in bite forces before and after implant therapy ($p=0.004$).

The chewing satisfaction obtained from patients in both groups was measured using VAS. The mean values and standard deviations of chewing satisfaction are presented in Table 2. The mean chewing satisfaction of patients after implant therapy (7.2±1.21) was significantly higher than the values before implant therapy (3.73±1.39). According to the paired t-test, a statistically significant difference was found in chewing satisfaction before and after implant therapy ($p=0.001$).

Discussion

The objective results of this study reject the null hypothesis. Implant retained overdentures increased the bite force values. This study's results are in agreement with previous studies. The present study showed that biting force and chewing satisfaction increased significantly for implant retained complete overdentures, compared to conventional complete dentures. Subjective patient-based outcomes, including ratings by patients of masticatory ability, food preferences, satisfaction with treatment, and oral health-related quality of life, have been increasingly recognized as critical outcomes for prosthodontic treatment (2,3). However, there is a need to validate patients' perception of changes, or lack of changes, in masticatory function with new implant retained overdentures. In fact, it has been repeatedly shown that the relationship between objective measures of masticatory performance and perceptional estimates of masticatory ability are weak in patients wearing conventional dentures (9) and implant retained dentures (10).

In this study, the chewing satisfaction obtained from patients in both groups was measured using VAS. The level of chewing satisfaction was documented in the range of 0–10 numerically and verbally as no chewing (0), low chewing satisfaction (1-3), moderate chewing satisfaction (4-6) and high chewing satisfaction (7-10). While patients have indicated that low chewing satisfaction before implant therapy, they have indicated that high chewing satisfaction after implant therapy.

A previous study concluded that biting abilities improved 2 months after insertion of new prostheses (13). In this study, a significant increase in masticatory efficiency was observed about 6 weeks after insertion of the new complete dentures. Other researchers have stated that a significant increase in bite force can be seen 10 months after the insertion of implants (1). In this study, bite force measurements were taken three months after the insertion of the complete dentures and the second measurements were taken three months after the insertion of the implant retained overdentures.

Some researchers have reported a significantly higher bite force for men (N=190) than for women (N=114) (1,25). Therefore equal numbers of men and women were an important factor in their study. However, in this present study, using a within-subjects design, bite force measurements were made before and after insertion of the dentures and bite force changes were evaluated for each patient.

In general, it is difficult to compare bite force studies due to differences in methodology. First, different types of measuring devices have been used in the past. For example, the most commonly used devices are piezoelectric elements or miniature strain gauges. However, positioning these devices along the dental arch may cause some unexpected results in bite force measurement (5). Second, differences in physical properties, such as the thickness of measuring devices, may affect biting abilities. Previous investigators have reported that the thickness of the device limits bite force (5,25). Biting on a 14-mm thick device results in higher bite forces than biting on a 10-mm-thick device (5) for healthy young adults of comparable age. In the present study, utilizing pressure detecting sheets avoided the device thickness problem. However, the differences between bite forces may also be caused by differences in muscle force, degree of mouth opening, pain experien-

Table 2— Chewing Satisfaction Values of Patients Before and After Implant Therapy

	Before	After
Bite Force	3.73[a]±1.39	7.20[b]±1.21

*Values having same letters were not significantly different for paired t test ($p>0.05$)



ced, or tilting of the dentures (4). Furthermore, there are differences between patient groups studied with regard to age, numbers of participants, and the male-to-female ratio. In many studies, this information is missing, which makes a reliable comparison difficult (1).

A previous study reported that mandibular residual ridge height is a critical factor relative to masticatory performance of complete dentures. When patients with an average mandibular residual ridge height were enrolled, no advantages in masticatory performance with implant retained overdentures compared to new complete dentures were found (7). In this study, based on the patient's panoramic radiographs, all the patients had a highly resorbed mandibular residual ridge.

Factors such as denture stability and the presence of pain in denture-bearing areas have been shown to affect masticatory performance and bite force. When these limiting factors exist, the degree of support of mandibular dentures by dental implants could be important for improving the function (1).

A review of the relevant literature showed that the type of implant and attachment system for mandibular implant retained dentures were found to have no effect on masticatory performance (16), so in this study the effects of different implant types or attachment systems on masticatory performance were not evaluated.

In conclusion, the results of the present study indicated that mandibular implant retained overdenture treatment, as opposed to conventional complete dentures, resulted in significantly better biting force and chewing satisfaction values. From a clinical standpoint, these results show that the advantages of implant retained mandibular overdentures were significant and that their wider application should be recommended.

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Rabia TERZİ[1]
Figen ABACI[2]

RESEARCH

COMPARISON OF DEPRESSION AND DAILY LIVING ACTIVITIES IN GERIATRIC PATIENTS WITH AND WITHOUT NEUROPATHIC PAIN

ABSTRACT

Introduction: The aim of the current study was to examine the effects of neuropathic and non-neuropathic pain on depression and activities of daily living in geriatric patients.

Materials and Method: The current study was conducted with 234 patients with a mean age of 67.2±4.2 years. Pain duration, pain severity, number of painful areas, chronic diseases, drugs used, and number of recurrent falls in the past year were recorded. Patients were divided into two groups, with and without neuropathic pain, according to the Leeds Assessment of Neuropathic Symptoms and Signs. Depression was assessed using the Geriatric Depression Scale. Patients were also evaluated on the Nottingham Extended Activities of Daily Living Index.

Results: We identified 62 (26.4%) patients with neuropathic pain. The patients' mean Geriatric Depression Scale score was 18.4±4.2, while the mean Geriatric Depression Scale score for the non-neuropathic pain group was 12.5±3.7. This difference was statistically significant (p=0.04). Scores on the Nottingham Extended Activities of Daily Living index showed no significant difference between the two pain groups. The neuropathic pain group was significantly higher than the non-neuropathic pain group with respect to chronic diseases, number of drugs used, and the number of falls in the past year (p=0.03, p=0.02, p=0.02, respectively).

Conclusion: There is a fairly high rate of neuropathic pain in the geriatric population. Neuropathic pain should be investigated in this population, especially in those with chronic diseases. In addition, patients with neuropathic pain should be assessed for depression.

Key Words: Neuralgia; Pain; Geriatrics; Aging; Depression; Activities of Daily Living.

ARAŞTIRMA

NÖROPATİK VE NON-NÖROPATİK AĞRISI OLAN GERİATRİK HASTALARDA DEPRESYON VE GÜNLÜK YAŞAM AKTİVİTELERİNİN KARŞILAŞTIRILMASI

ÖZ

Giriş: Bu çalışmanın amacı geriatrik hastalarda nöropatik ve non nöropatik ağrının, depresyon ve günlük yaşam aktivitelerine etkilerini incelemektir.

Gereç ve Yöntem: Çalışma, yaş ortalaması 67,2±4,2 olan 234 hasta üzerinde gerçekleştirilmiştir. Hastaların ağrı süresi, ağrı şiddeti, ağrılı bölge sayısı, kronik hastalıkları, kullandıkları ilaçlar, son bir yılda tekrarlayan düşme varlığı kaydedildi. Hastalar Leeds Nöropatik Semptom ve Bulgu Değerlendirmesi ölçeğine göre nöropatik ağrısı olan ve olmayanlar olmak üzere iki gruba ayrıldı. Depresyon değerlendirmede Geriatrik Depresyon Skalası, günlük yaşam aktivitelerini değerlendirmede, Notthingham Genişletilmiş Günlük Yaşam Aktiviteleri İndeksi kullanıldı.

Bulgular: Çalışmamızda 62 (%26,4) hastada nöropatik ağrı tespit edilmiştir. Geriatrik depresyon skorları, nöropatik ağrısı olan grupta 18,4±4,2 iken, nöropatik ağrısı olmayan grupta 12,5±3,7 idi. Bu fark istatistiksel olarak anlamlı bulundu (p=0,04). Her iki grup arasında günlük yaşam aktivite skorları arasında istatistiksel anlamlı fark bulunmamıştır. Nöropatik ağrısı olan grupta kronik hastalık sayısı, devamlı kullanılan ilaç sayısı ve son bir yılda tekrarlayan düşme öyküsü varlığı istatistiksel olarak anlamlı oranda yüksek bulunmuştur (p=0,03, p=0,02, p=0,02).

Sonuç: Geriatrik popülasyonda nöropatik ağrı oldukça yüksek sıklıkta görülmektedir. Özellikle çoğul kronik hastalığı olan yaşlılarda nöropatik ağrı sorulmalı, nöropatik ağrı varlığında ise depresyon yönünden değerlendirme yapılmalıdır.

Anahtar Sözcükler: Nöralji; Geriatri; Yaşlanma; Depresyon; Günlük Yaşam Aktiviteleri.

Correspondance

Rabia TERZİ
Kocaeli Derince Training and Research Hospital, Physical Medicine and Rehabilitation Clinic, KOCAELİ

Phone: 0262 233 55 41
e-mail: drrabia1@yahoo.com

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[1] Kocaeli Derince Training and Research Hospital, Physical Medicine and Rehabilitation Clinic, KOCAELİ
[2] Kocaeli Derince Training and Research Hospital, Psychiatry Clinic, KOCAELİ

Introduction

Pain is a common complaint in the elderly population. Above the age of 65 years, more than half of the male population and two thirds of the female population report pain complaints (1). The increasing prevalence of degenerative joint diseases in geriatric patients causes pain for a large number of elder people (2), and physical disability caused by pain further results in the restriction of daily life activities and provides a basis for the development of depression (3). In addition to degenerative joint diseases, a higher prevalence of other conditions affecting both the peripheral and central nervous systems, such as diabetes, stroke, herpetic neuralgia, amputation, and cancer, poses a risk of developing neuropathic pain for this patient group (4). Neuropathic pain is defined as pain that develops in relation to central or peripheral nervous system pathology (5). The prevalence of neuropathic pain varies between 0.6 and 1.5% of the general population (4). It has been reported that 35-54% of the elderly population suffers from neuropathic pain (6,7). Neuropathic pain exerts negative effects on daily life (8). In a study that included all age groups, the presence of neuropathic pain restricted daily life activities in 65% of the participants (9). To our knowledge, there are no comprehensive studies that have evaluated the effects of neuropathic pain on depression and daily life activities. The aim of the present study was to determine the prevalence of neuropathic pain in geriatric patients presenting to our clinic complaining of pain, and to evaluate the effects of neuropathic pain on depression and daily life activities.

Materials and Method

The present study used a cross-sectional design to evaluate 234 patients who presented to the outpatient clinic due to pain between 2012 and 2013, and who fulfilled our inclusion criteria. Approval for the current study was obtained from the ethics committee. The data were collected using face-to-face interviews. The study included volunteer patients aged over 65 who had normal cognitive functioning, proficiency in the Turkish language sufficient for the interview, and who had experienced pain for at least the last three months. Patients with a known history of psychiatric conditions, bedridden patients, and those dependent on a wheelchair were excluded from the study. During the interview, socio-demographic features, chronic illnesses, medications, engagement in regular physical exercises, and history of recurrent falls in the past year were recorded. Regular physical exercise was defined as performing exercise for at least half an hour a day, at least three days a week.

Evaluation of Pain

The duration of pain, number of painful areas, and number of doctor visits due to pain in the past year were recorded. The pain level was evaluated using the Geriatric Pain Measurement Scale and the visual analogue scale (VAS). The Geriatric Pain Measurement Scale consists of 24 questions about pain; a score of 30 points and below indicates mild pain, a score of 31-69 points indicates moderate pain, and a score of more than 70 points indicates severe pain (10). Neuropathic pain was evaluated using the LANSS pain scale, whose validity and reliability have been established for use in Turkey (11). Patients who scored more than 12 points were assigned to the neuropathic pain group (12), while the remaining patients were assigned to the non-neuropathic pain group.

Evaluation of Depression and Daily Life Activities

Depression status was evaluated using the Geriatric Depression Scale (GDS), and the Nottingham Extended Activities of Daily Living (NEADL) scale was used to evaluate daily activities. Both of these scales use a questionnaire format.

The NEADL scale consists of 22 questions rated between 0 and 3 points, and the total score ranges between 0 and 66 points. The Turkish language version of the scale has been evaluated by Sahin et al. for its validity and reliability (13).

The GDS is a validated assessment form used by Yesavage et al. (14) to screen the elderly population for depression. The scale consists of 30 questions, each answered as "yes" or "no". Depressive responses are scored as 1 and non-depressive responses are scored as 0. The highest score possible is 30 points; a score of 0-11 indicates no depression, a score of 11-14 indicates possible depression, and a score of 14 points and above indicates definite depression (15).

Statistical Analysis

Statistical analyses were performed using the SPSS Windows 13.0 software package. Data were expressed as mean±standard deviations and percentages. In independent group comparisons, independent samples t-tests were used for parametric variables that were normally distributed, and Mann-Whitney U-tests were used for parametric variables that did not show a normal distribution. Chi-square and Fisher's exact chi-square tests were used to compare independent group ratios, and Spearman's test was used for correlation analyses.



Given the number of chronic diseases and the number of medications, ANCOVA (covariance analysis) was used in the statistical evaluations. A p value<0.05 was considered statistically significant, using a 95% confidence interval.

RESULTS

Of 234 patients, 62 (26.4%) were found to have neuropathic pain. The mean age was 66.9±5.1 years (32 females and 30 males) in the neuropathic pain group. The mean duration of pain was 5.8±4.4 months. While the mean VAS pain score at rest was 6.5±2.4, the mean VAS pain score with movement was 6.7±1.8. The mean number of painful areas was 3.1±1.4 in the neuropathic pain group, and the mean number of doctor visits in the past year due to pain was 4.2±2.1. In the non-neuropathic pain group, the mean age was 67.4±4.2 years (93 females and 78 males). The mean duration of pain was 5.2±4.9 months. The mean VAS pain score was 5.9±1.4 at rest and 6.6±2.3 with movement. The mean number of painful areas was 3.7±2.1 in the non-neuropathic pain group, and the mean number of doctor visits in the past year due to pain was 4.1±1.9. Twenty-four (57.1%) patients in the neuropathic pain group and 90 patients (52.3%) in the non-neuropathic pain group performed regular physical activities. There were no significant differences between the two groups in terms of age, gender, mean duration of pain, VAS pain score, number of painful areas, number of doctor visits, and regular physical activity (p>0.05). Fourteen patients (33.3%) in the neuropathic pain group and 29 patients (16.8%) in the non-neuropathic pain group had a history of recurrent falls. There was a statistically significant difference between the two groups in terms of fall history (p=0.03).

When the two groups were compared in terms of sociodemographic features, no significant differences were found for smoking status, marital status, and educational level (p>0.05). (Table 1) The mean number of chronic illnesses and the mean number of medications were 4.1±1.8 and 5.1±2.1, respectively, in the neuropathic pain group and 2.6±1.9 and 2.4±1.4, respectively, in the non-neuropathic pain group. There was a statistically significant difference between the two groups in terms of the mean number of chronic illnesses and the mean number of medications (p=0.03 and p=0.02, respectively).

The geriatric depression score was 18.4±4.2 in the neuropathic pain group and 12.5±3.7 in the non-neuropathic pain

Table 1— Socio-Demographic Features of the Two Groups and Evaluation of Fall Histories.

	Neuropathic Pain Group (n =62)	Non-Neuropathic Pain Group (n=172)	p
Age (mean±sd)	66.9±5.1	67.4±4.2	0.51
Female, n (%)	32 (52.3%)	93 (54%)	0.38
Male, n (%)	30 (47.7%)	79 (46%)	0.54
Body Mass Index (kg/m²)	28.03±4.5	27.38±4.1	0.28
Education level, number of individuals (%)			0.4
Literate	6 (14.2%)	12 (6.9%)	
Primary School	24 (57.1%)	120 (69.7%)	
Secondary School	8 (19%)	30 (17.4%)	
High School	4 (10.7%)	10 (6%)	
University	0 (0%)	0 (0%)	
Marital Status (number of individuals)			
Married / Single	42/20	119/53	0.7
Smoking status, number of individuals n (%)			0.6
Current Smokers	14 (22.5%)	37 (21.5%)	
Former Smokers	20 (32.2%)	51 (29.6%)	
None-Smokers	28 (45.3%)	84	
Patients with a history of fall within the last 1 year, number of individuals, n (%)	36 (58.0%)	68 (39.5%)	0.02*
Number of chronic diseases (mean±SD)	4.1±1.8	2.6±1.9	0.03*
Number of regular medications (mean±SD)	5.1±2.1	2.4±1.4	0.02*

*p<0.05

Table 2— Comparison of Pain, Depression, and Daily Activity Scores of the Two Groups.

	Neuropathic Pain Group (n =62)	Non-Neuropathic Pain Group (n=172)	p
NEADL Scala Score	28.5±5.9	30.1±6.2	0.1
LANSS Score	15.6±2.3	6.8±3.9	0.01*
Geriatric Pain Measurement Scale Score	66.5±9,2	64.7±7.4	0,2
Geriatric Depression Scale Score	18.4±4.2	12.5±3.7	0.04*

NEADL: Notthingam extended activities of daily living. LANSS: Leeds Assessment of Neuropathic Symptoms and Signs.
*p<0.05

group. Statistical evaluations were performed with the data adjusted for the number of chronic illnesses and the mean number of medications and a statistically significant difference was found between the groups in the depression scores (p=0.04). The depression score was above 11 in 42 patients (67.7%) with neuropathic pain, and in 105 patients (61.1%) in the non-neuropathic pain group. There were significant correlations between geriatric depression scores and duration of pain, geriatric pain measurement scale scores, and the number of painful areas (p=0.02, p=0.01, and p=0.04, respectively).

The mean score on the activities of daily living scale was 28.5±5.9 in the neuropathic pain group and 30.1±6.2 in the non-neuropathic pain group. No statistically significant difference was found between the two groups when the evaluation was performed with the data adjusted for the number of chronic illnesses and the mean number of medications (p=0.1). The scores of the two groups on pain, depression, and activities of daily living scales are presented in Table 2.

Discussion

Studies in the literature have shown that pain and depression are comorbid. The response of the brain to inflammatory signals is thought to contribute to the development of depression and chronic pain (16). Some studies have shown an increased prevalence of depression in patients with chronic pain (17) and, conversely, an increased prevalence of pain in patients with depression (18).

The depression rate was 19.8% in individuals with chronic pain, while the rate of major depression in general population is 5.9% (19). In hospitalized patients with the diagnosis of severe depression, 92% were shown to have at least one complaint related with pain and 76% were found to have pain in more than one point of the body (20). The presence of a depressive disease is demonstrated in some studies to increase the risk of pain in the musculoskeletal system, chest, and head over three years (21,22).

In the present study, depression scores were found to be significantly higher in patients with neuropathic pain. Both groups were composed of elderly patients with chronic pain. Higher depression scores in the neuropathic pain group are considered to be associated with the poor prognosis of neuropathic pain compared to non-neuropathic pain, a limited response to non-steroid anti-inflammatory drugs, the common occurrence of concurrent sleep disorders (13), and the social isolation of these patients (24). The present study did not address the response to medications administered for pain, sleep disorders, or the presence of social isolation. These can be regarded as limitations of the present study.

Neuropathic pain has been reported in the literature to cause more psychological problems, which is compatible with the results of our study (25,26). Bouhasirra et al. reported that the Douleur Neuropathique 4 (DN4) questionnaire score was an independent predictive factor in major depression and development of anxiety (25). It is important to note that the presence of neuropathic pain should alarm the physician to evaluate such a patient in terms of depression with a multidisciplinary approach in the geriatric patient population, which is one of the most frequently encountered group of patients for the physiatrists.

The primary condition causing neuropathic pain can also have direct effects on depression and activities of the daily life. The conditions that result in neuropathic pain were not evaluated individually in the present study. This is another limitation of the study. Denkinger et al. (27) found an association between depression and the severity and frequency of pain, and the number of painful areas in elderly patients; however, they did not report an association between depression and the quality and duration of pain. Yıldız et al. (28) did not find a relationship between the severity of pain and depression scores in elderly patients residing in a nursing home. The present study found positive correlations between depression and the duration of pain and the number of painful areas. The



restriction in daily life activities can also provide a basis for depression (18). Although not statistically significant, activities of daily life were found to be more restricted in patients with neuropathic pain than in those with non-neuropathic pain. The restrictions in daily life activities may have contributed to the significantly higher depression scores observed in patients with neuropathic pain. One study reported that one third of geriatric patients had chronic pain and approximately one fifth of these patients had restrictions in the activities of daily living (29). Activities of daily life may be restricted in both pain groups due to chronic pain.

Female gender (30), obesity (31), and cigarette smoking (32) have been reported to carry risks for the development of neuropathic pain. Chronic consumption of nicotine has been demonstrated to increase neuropathic pain by causing structural and functional changes in the nociceptive pathways (33). The differences in the pain sensitivity between different genders is suggested to develop due to the interactions between sex steroids and neuroimmune functions (34). The rate of conditions with chronic pain have been shown to be higher in divorcees (35). No statistically significant differences between the two groups were found in terms of gender, body mass index, cigarette smoking, and marital status in the present study, in contrast with the literature findings.

In the present study, the number of chronic illnesses and the number of regular medications were found to be significantly higher in the neuropathic pain group. One of the most important problems in the elderly population is the presence of multiple comorbid conditions. Some chronic disorders are known to cause neuropathic pain (4). Therefore, the development of neuropathic pain increases with an increasing number of chronic disorders (4). In a study by Berber et al., 70% of patients with two or more comorbidities had neuropathic pain, while only 13% of patients of a similar age with a single morbidity had neuropathic pain (35).

In the present study, the number of patients having a history of falls in the past year was found to be significantly higher in the neuropathic pain group than in the non-neuropathic group. In a meta-analysis by Brendon et al., chronic pain was found to be a risk factor for falls (36). A study by Terzi et al. (37) found a relationship between recurrent falls and multiple drug use in geriatric patients. The high prevalence of recurrent falls in the neuropathic pain group in the present study suggests a relationship between chronic pain and multiple drug use.

In conclusion, the patients with neuropathic pain had higher depression scores and had a higher risk of developing depression than patients in the non-neuropathic pain group. The use of multiple medications, the presence of chronic disorders, and a history of recurrent falls was significantly higher in patients with neuropathic pain. The activities of daily living were restricted by all pain, independent of its character.

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Cem Coşkun AVCI[1]
Feyza ÜNLÜ ÖZKAN[2]
Ömer Kays ÜNAL[3]
İsmail TÜRKMEN[3]
Tuhan KURTULMUŞ[1]
Gürsel SAKA[1]
Necdet SAĞLAM[1]

Correspondance

Feyza ÜNLÜ ÖZKAN
Fatih Sultan Mehmet Training and Research Hospital, Physical Medicine and Rehabilitation Clinic, İSTANBUL

Phone: 0216 578 30 00
e-mail: feyzamd@yahoo.com

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[1] Ümraniye Training and Research Hospital, Orthopedics ad Traumatology Clinic, İSTANBUL
[2] Fatih Sultan Mehmet Training and Research Hospital, Physical Medicine and Rehabilitation Clinic, İSTANBUL
[3] Medeniyet University, Göztepe Training and Research Hospital, Orthopedics and Traumatology Clinic, İSTANBUL

RESEARCH

THIGH PAIN MIGHT BE A PRODROMAL SYMPTOM OF ATYPICAL FRACTURE IN LONG TERM BISPHOSPHONATE USERS

ABSTRACT

Introduction: Osteoporosis causes bones to lose their resilience, increases fragility and results in bone fracture even with minimal trauma during daily activities. We aimed to examine the patients who were treated for atypical fractures in terms of long-term bisphosphonate usage for the treatment of osteoporosis.

Materials and Method: A retrospective study was conducted on 21 patients who underwent surgery for an atypical femur fracture between years 2007-2013. Demographic data, history of bisphosphonate treatment, trauma type, patient complaints prior to fracture, fracture type and the type of treatment used for the fracture were assessed.

Results: The number of cases with atypical fractures was 21 and all of them had history of prolonged bisphosphonate use. The number of female patients was 19, and 2 patients were male, with an average age of 76.4 years. The number of patients with diaphyseal femur fractures was 17 and 4 patients had subtrochanteric femur fractures. Among the patients that have been using a bisphosphonate, alendronate (70 mg) was the most frequently used medication. The average length of bisphosphonate usage was 8.1 years and the average length of time that elapsed until a fracture occurred subsequent to the start of drug usage was 7.2 years. Prior to fracture, all of the patients had complaints of thigh pain that lasted on average for 8.5 months.

Conclusion: Bisphosphonates are one of the widely used agents used in the treatment of osteoporosis. Thigh pain in patients with prolonged bisphosphonate usage should alarm the physicians for possible atypical fracture in the future.

Key Words: Disphosphonate; Femoral Fracture; Osteoporosis.

ARAŞTIRMA

UZUN DÖNEM BİFOSFONAT KULLANAN HASTALARDA UYLUK AĞRISI ATİPİK KIRIK HABERCİSİ OLABİLİR

ÖZ

Giriş: Osteoporoz kemiklerin elastikiyetini azaltarak ve frajilitesini artırarak günlük aktiviteler sırasındaki minimal travmalarla bile kırık oluşmasına neden olur. Bu çalışmada atipik kırık nedeniyle tedavi edilen hastalarda uzun dönem bifosfonat kullanım öyküsü araştırıldı.

Gereç ve Yöntem: Atipik femur kırığı nedeniyle 2007-2013 yılları arasında opere olan 21 hasta demografik veriler, bifosfonat kullanım öyküsü, travma tipi, kırık öncesi semptomlar, kırık tipi ve kırık için uygulanan tedavi açısından incelendi.

Bulgular: Atipik kırıklı 21 hastanın tümünde uzun süreli bifosfonat kullanım öyküsü mevcuttu. İncelenen vakaların 19'u kadın, 2'si erkekti, yaş ortalamaları 76,4 olarak bulundu. Hastaların 17'sinde diafizer femur kırığı, 4'ünde subtrokanterik femur kırığı saptandı. En fazla (%33,3) kullanılan bifosfonatın 70 mg'lık alendronat olduğu saptandı. Ortalama bifosfonat kullanım süresi 8,1 yıl idi, ilaca başlanması ve kırık oluşumu arasında geçen süre ortalamasının 7,2 yıl olduğu gözlendi. Kırık oluşumundan önce tüm hastalarda ortalama 8,5 ay süren bir uyluk ağrısının olduğu saptandı.

Sonuç: Bifosfonatlar osteoporoz tedavisinde en sık kullanılan ilaçlardandır. Uzun süreli bifosfonat kullanımı olan hastalarda uyluk ağrısının varlığı muhtemel bir atipik kırığın habercisi olabilir.

Anahtar Sözcükler: Bifosfonat; Femur Kırığı; Osteoporoz.

Introduction

Osteoporosis, commonly seen in post-menopausal females and elderly adults, is defined as a systemic bone disease in which the risk of bone fractures increases as the bones weaken. The weakening of the bones increases fragility fractures during daily activities (1). Osteoporosis is responsible for 75% of bone fractures in the elderly, which may cause comorbidity and complex complications. The best approach in combating osteoporotic fractures is preventive strategies and medications. Drug treatment is based on bone metabolism and pathogenesis of the disease. Agents such as calcium, vitamin D and their metabolites, as well as oestrogen, calcitonin, and bisphosphonates prevent bone destruction, while parathyroid hormone, anabolic steroids, and sodium fluoride components increase bone formation (2).

Bisphosphonates have a wide range of therapeutic uses in osteoporosis, Paget disease and some syndromes related to the bone (3,4). These agents prevent bone resorption by inhibiting osteoclast functions and promoting osteoclast apoptosis. Alendronate was approved by the United States Food and Drug Administration (FDA) in 1995, for treating post-menopausal osteoporosis. Shortly thereafter, alendronate gained popularity and became one of the most frequently used agents for osteoporosis. However, side effects resulting from prolonged usage have been reported, including gastrointestinal effects such as dyspepsia, oesophageal cancer, mandibula osteonecrosis, atrial fibrillation, and atypical bone fractures (5-8).

An atypical femur fracture following a low energy trauma was first reported in 2005 related to prolonged alendronate usage (9). Following an increase in atypical fracture reports, the American Bone and Mineral Research Society studied the correlation between atypical fractures and bisphosphonate usage, and determined the major and minor criteria defining atypical fractures in 2009 (10) (Table 1). However, despite numerous studies, a clear correlation between prolonged usage of bisphosphonate and atypical fractures has not been found (11-14). In this study, we aimed to examine patients who have used bisphosphonate for a long period and were treated for atypical fractures.

Materials and Method

A retrospective study was conducted on 21 patients who underwent surgery for an atypical fracture from 2007–2013, with a history of bisphosphonate use. We collected demographic information, bisphosphonate treatment duration, treatment type, trauma type, patient complaints prior to fracture, fracture type and the type of treatment used for the fracture.

Results

We evaluated 21 cases of atypical fracture that occurred due to prolonged bisphosphonate use. The number of female patients was 19, and 2 patients were male, with an average age of 76.4 years. The number of patients with diaphyseal femur fractures was 17 and 4 patients had subtrochanteric femur fractures (Figure 1). The type of bisphosphonate and the duration of usage are shown in Table 2. Among the patients who had been using a bisphosphonate, alendronate (70 mg) was the most frequently used medication. The average length of bisphosphonate usage was 8.1 years and the average length of time that elapsed until a fracture occurred subsequent to the start of drug usage was 7.2 years. Patients reported having used the drug continuously. The average age when a fracture occurred was 75.3 years. The number of patients who underwent surgery for the second time due to a femur fracture on the other side was 4, on an average 42 months after the initial surgery. Prior to fracture, all of the patients had complaints of thigh pain that lasted on average for 8.5 months. All of the fractures occurred after falling in the house, which caused minor trauma. An intramedullary nail was used to treat 20 patients, while one patient was treated conservatively. A

Table 1— Major and Minor Criteria of Atypical Fractures.

Major Criteria	Minor Criteria
Femur subtrochanteric or diaphyseal fracture	Cortical thickening
Transverse or oblique fracture	Periosteal reaction in the lateral cortex
Free of trauma or minimal trauma	Prior prolonged aching
Medial spike in complete fractures	Being bilateral or prolonged healing
Basic fracture	Drug related (bisphosphonates, steroids, PPI)



Figure 1— Atypical subtrochanteric femur fracture.

segmental fracture occured in 3 patients during the operation due to femoral bowing and were treated accordingly.

Discussion

The incidence of osteoporotic fractures in the elderly has increased with prolonged life expectancy. Senile female and male osteoporosis patients over the age of 70 are affected at the same rate, with equal loss of trabecular and cortical bone. Both secondary hyperparathyroidism and decreased age-related osteoblast activity are responsible for bone loss. Additionally, cellular aging, decreased cellular response to cytokines and growth hormone, as well as decreased levels of insulin-like growth factor play a role in the pathophysiology of senile osteoporosis. Proximal femur, proximal tibia, pelvis and multiple compression vertebrae fractures are also common in this age group.

Post-menopausal osteoporosis occurs in post menopausal females and is characterised by oestrogen deficiency. Bone loss is greater in trabecular bone than in cortical bone and is thus more prevalent in the first 3-4 years after menopause. Post-menopausal bone loss primarily results from increased osteoclastic activity. The balance between construction and destruction is disrupted due to low oestrogen levels, increased cytokine stimulation of osteoclast activity and osteoblast apoptosis, while the normal bone mineral-matrix balance is unchanged. Moreover, calcium secretion into the urine increases, while parathyroid hormone and $1,25(OH)_2D_3$ levels fall. The most significant clinical finding is crush-collapse vertebrae, which results from low-energy trauma and distal radius fractures (15).

In recent years, the importance attached to drug development and quality of life has increased the opportunities for diagnosis and treatment of osteoporosis. Bisphosphonates are one of the agents used in treating and prophylactically preventing osteoporosis. These compounds strongly inhibit bone resorption, decrease osteoclast activity, and increase osteoclast apoptosis (16). Unlike other agents, the affinity of bisphosphonates for bone and their mechanism of action facilitate their binding to hydroxyapatite crystals. During the remodelling stage, they are re-released into the bloodstream and reconnect to the bone, which allows them to be active once more (17).

Black et al. reported an increase in clinically recognized vertebral fractures but no increase in nonvertebral fractures or morphometric vertebral fractures among patients discontinuing alendronate after 5 years of treatment (18). In our study, 17 of our patients had used alendronate for more than 5 years. Park-Wyllie et al. (12) observed that in 205466 females who

Table 2— Duration of Bisphosphonate Usage.

Drug (mg)	n	Duration (years)
Alendronate (70 mg)	7	8.1
Risendronate (35/75 mg)	3	6.3
Alendronate (70 mg)+Risedronate (35/75 mg)	5	10.2
Alendronate (70 mg)+Ibandronate (150 mg)	2	11.5
Alendronate (70 mg)+Risedronate (35/75 mg)+Ibandronate (150 mg)	2	12
Alendronate (70 mg)+Zoledronate (5 mg)	1	7
Risendronate (35/75 mg)+Zoledronate (5 mg)	1	9

had used bisphosphonate, 716 patients had a subtrochanteric and/or diaphyseal fracture. They categorized participants according to duration of treatment as long-term users (>5 years of therapy), intermediate users (3-5 years of therapy) and short-term users (100 days to 3 years). These exposure groups were compared with a reference group of transient (<100 days in total) users. They concluded that compared with transient bisphosphonate use, treatment for 5 years or longer was associated with an increased risk of subtrochanteric or femoral shaft fracture. However, they did not evaluate radiologically atypical fracture parameters. In our study, when fractures were classified according to the minor and major criteria, 21 cases were deemed as atypical fractures and the average length of bisphosphonate use was 8.1 years.

Atypical fractures are seen in patients with abnormal bone structure. In the elderly, fractures caused by a simple fall commonly occur in the trochanter region of the lower extremities (19). However, in patients who have used bisphosphonate for a long period, minor traumas can cause fractures close to the femur diaphysis with enlargement seen in the broken region and thickening of the lateral cortex (10,20). Schilcher and Aspenberg reported that of 91956 females over 55 years old, 3087 used bisphosphonates continuously. In this population, the incidence of fracture in the femur diaphysis was 1/1000 in the group that used bisphosphonates and 0.02/1000 in the group that did not (21). In our study, 17 cases had fractures of the femur diaphysis and 4 cases had subtrochanteric fractures, defined as atypical fractures based on radiological findings.

In a multicenter study investigating the pharmacological treatment preferences in osteoporosis, 33.4% of physicians prescribed alendronate to patients with primary osteoporosis and 36.8% prescribed alendronate to patients with secondary osteoporosis (22). In our study the most commonly used bisphosphonate was alendronate, consistant with the literature, and 7.2 years of bisphosphonate use was associated with an increased incidence of atypical femur fracture.

Thigh pain in long term bisphosphonate users is an alarming syptom before the occurrence of an atypical femur fracture. The atypical femur fracture is frequently preceded by a history of persistent thigh pain prior to low-energy trauma (23). This is one of the factors shown to be associated with atypical femoral fractures and the prevelance is reported to be 63.6% to 70% (7). Similarly, in our study, all of the patients stated that they had complained of thigh pain for a long time before the femur fracture.

Simultaneous bilateral diaphyseal femoral fractures are rare; it is reported in the trauma literature that only 2% to 7% of femoral fractures are bilateral. They usually result from pathologic fractures (24). Bilateral femur fracture is one of the minor criteria for atypical femur fractures and in our study, 4 cases had femur fracture surgery on the other side, 42 months, on average, after the initial surgery (Figure 2). Although this number was comparable to similar studies in the literature, relatively few patients were enrolled in this study.



Figure 2— Operated bilateral femur fracture.

In conclusion, the underlying cause and subsequent mechanisms in the development of atypical fractures remain undefined. Further long-term, prospective observational research is needed to address the role of prolonged bisphosphonate therapy in the development of these fractures. The possibility of atypical fractures should be considered in patients who report unexplained thigh or groin pain, and radiographic evaluation is recommended to identify prodromal symptoms in patients with a history of long-term biphosphonate therapy.

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Hasan Hüseyin KOZAK[1]
Ali Ulvi UCA[1]
Faruk UĞUZ[2]

Case Report

BISOPROLOL-INDUCED DELIRIUM IN A PATIENT WITH ISCHEMIC STROKE: A CASE REPORT

Abstract

Delirium is a common neuropsychiatric syndrome that involves a number of symptoms including diffuse cognitive impairment, hallucinations, mood lability and disturbances in the sleep-wake cycle. Besides, delirium is a common condition associated with adverse outcomes, including increase in morbidity, mortality, and need of health services utilization. Even though the etiology of cognitive impairment is multifactorial, drugs also are known to be an important cause of delirium. In this study, we present a patient manifesting a bisoprolol-induced acute delirium, for whom the delirium symptoms completely disappear after bisoprolol was ceased. Bisoprolol is widely used in cardiology for the treatment of hypertension and arrhythmia. Beta-blocking agents have been recognized for some time to have central nervous system effects, which could adversely cause common psychiatric syndromes.

Key Words: Atrial Fibrillation; Bisoprolol; Delirium.

Olgu Sunumu

İSKEMİK İNMELİ BİR HASTADA BİSOPROLOLE BAĞLI DELİRYUM: BİR OLGU SUNUMU

Öz

Deliryum yaygın bilişsel bozukluk, hallüsinasyonlar, duygu-durum değişiklikleri ve uyku-uyanıklık döngüsünde bozulmalar gibi çok sayıda belirtiyi içeren yaygın bir nöropsikiyatrik klinik sendromdur. Hastaneye yatan tüm hastaların %10-30'unda görülmektedir. Ayrıca, Deliryum morbidite, mortalite ve sağlık hizmetlerinin kullanılmasında artmayı içeren kötü sonuçlarla ilişkili yaygın bir durumdur. Kognitif yetersizliğin etiyolojisi multifaktöriyel olarak düşünülse de, ilaçların da deliryumun önemli bir nedeni olduğu bilinmektedir. Bu çalışmada, bisoprololün neden olduğu akut deliryum tablosuyla gelen ve bisoprololün kesilmesiyle deliryum semptomlarının tamamen kaybolduğu bir hastayı sunuyoruz. Bisoprolol kardiyologlar tarafından hipertansiyon ve aritmi tedavisi için yaygın olarak kullanılmaktadır. Beta blokör ajanların bazen santral sistemi etkilerinin olabildiği ve bu nedenle yaygın psikiyatrik sendromların istenmeyen bir nedeni olabildikleri belirlenmiştir.

Anahtar Sözcükler: Atrial Fibrilasyon, Bisoprolol, Deliryum.

Correspondance

Hasan Hüseyin KOZAK
Necmettin Erbakan University, Meram Faculty of Medicine, Department of Neurology, KONYA

Phone: 0507 380 92 25
e-mail: hhkozak@gmail.com

Received: 30/09/2014

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[1] Necmettin Erbakan University, Meram Faculty of Medicine, Department of Neurology, KONYA
[2] Necmettin Erbakan University, Meram Faculty of Medicine, Department of Psychiatry, KONYA

INRODUCTION

Cerebrovascular diseases (CVD) are known to be among the most frequently encountered diseases causing disability, and mentioned in third rank as a cause of death after heart diseases and cancer. Cardioembolic strokes account for one fourth to one third of all types of ischemic strokes. Atrial fibrillation (AF), the prevalence of which increases with aging, is the most common cause of cardioembolic stroke. Paroxysmal atrial fibrillation (PAF) is associated with a comparable increase in risk of ischemic stroke as permanent AF. Delirium is a psychiatric disorder characterized with primarily a disturbance of consciousness, attention, cognition, and perception but can also affect sleep, psychomotor activity, and emotions (1). According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-V), it develops over a short period of time (usually hours to days) and tends to fluctuate during the course of the day. It may occur due to a general medical condition, a substance or medication (2). Delirium is a significant problem for older people and is associated with poor outcomes including longer stay in the hospital, increased risk of morbidity and mortality (3).

Bisoprolol is a widely used agent for the treatment of hypertension and arrhythmia. However, central nervous system effects of beta-blocking agents, and the fact that they can cause common psychiatric syndromes (5%–20%) is known for a long time (4,5). In this study, we present a patient manifesting a bisoprolol-induced acute delirium, for whom the delirium symptoms completely disappear after bisoprolol was ceased.

CASE

A 87-year-old woman with acute weakness and numbness in right arm and leg was admitted to our neurology unit. The patient's history was unremarkable and she had no history of smoking, alcohol, drug use, or any neurologic problems. The patient was aware of her name, and actual place and time. Neurological examination revealed right central facial paralysis, right hemiparesis and right hemihypoesthesia. The blood pressure of the patient was 130/75 mmHg. Laboratory tests (i.e. complete blood count, metabolic panel, thyroid-stimulating hormone, and urinalysis) were unremarkable. The initial cranial computed tomography (CT) was normal. In examinations to clarify the etiology of right-sided hemiparesis, patient's brain MRI (i.e. T2 hyperintense, T1 hypointense slices extending from left parietal to convexity, diffusion images of acute infarct region observed as diffusion restriction) revealed ischemic stroke. As soon as the diagnosis of ischemic stroke was made, the patient was put on 100 mg of acetylsalicylic acid treatment. The electrocardiography of patient who was consulted with a cardiologist to investigate the etiology of ischemic stroke, was viewed as a normal sinus rhythm. Paroxysmal atrial fibrillation (PAF) was found in patient's 24 hour holter electrocardiogram and his echocardiography was observed as EF: 55% PAB: 25 TY1° MY1°. Increase in bilateral carotid intima-media thickness was observed in doppler ultrasonography of carotid-vertebral. The patient, when history and clinical status taken together, was diagnosed with cardioembolic induced ischemic stroke. As consulted to cardiology clinic, the patient was started 5 mg bisoprolol and warfarin therapy. Within 12 hours of bisoprolol administration, the patient developed acute symptoms of delirium including agitation, disorientation, aggression, and generalized confusion. According to DSM-V, the patient was diagnosed with acute delirium. The investigations including hemogram, biochemical evaluation of renal and liver function, electrolytes, urinalysis, arterial blood gas analysis, electrocardiogram, and chest x-ray were repeated at each delirium episode, and found to be normal. After development of clinical condition, the patient's repeated physical and neurological examination was normal. Repeated cranial MRI revealed the same findings, and thus, any other possible intracranial etiologic causes were excluded. Therefore, we think that delirium could be caused by bisoprolol administration. After the drug was discontinued, patient's symptoms spontaneously resolved without any medication within the following twenty-four hours. It is worth to attention that delirium symptoms including confusion, distractibility, agitation, disorientation and perception disturbances recurred two more times after recommencement of bisoprolol. With bisoprolol started again, delirium table improved and the situation got better within 24 hours after the cease of medication. During the episodes of delirium, the blood pressure and fever of the patient was normal. There were no new neurological symptoms or findings. The patient was not given any antipsychotic medicine, in order to be able to follow the general course. Twenty-four hours later, the patient's delirium completely resolved and he was alert and oriented. Bisoprolol was stopped after 3 recurrences of delirium. Diltiazem was given for PAF, and no adverse effect was observed. In the follow-up period in hospital, the patient had no attack of delirium. After discharge of the patient, outpatient clinic controls have revealed mild right hemi-paresis with no delirium attack at all.

Discussion

Delirium is defined as a mental disorder with reversible acute continuing with confusion, mental status disorder, emotional liability, hallucinations or illusions and inappropriate, impulsive, unrealistic and harsh treatment. Conditions such as infection, fever, metabolic imbalances, renal or hepatic dysfunction, endocrine dysfunction, thiamine deficiency, drug intoxication or failure, postoperative conditions, severe blood loss, cardiac arrhythmias and cardiac insufficiency, hypertensive encephalopathy, head trauma, epileptic attacks, drug side effects, some focal brain lesions (medial aspect of the right parietal lobe and occipital lobe), sensory deficiency (blindness, deafness) are known to cause delirium. In order to explain delirium table, in patients who have the decline of neurotransmitters, cerebral oxidative metabolism deficiency, cholinergic dysfunction, inflammation or infection, theories such as lymphokines have been proposed (6).

Bisoprolol is widely used in cardiology for the treatment of hypertension and arrhythmia. Bisoprolol, a potent B1-selective, is a beta-blocker and it is almost completely absorbed from the gastrointestinal tract. It binds to serum proteins approximately 30% and reaches to peak plasma concentration within 2-4 hours. It is eliminated equally via liver and kidney, approximately 50% unchanged in the urine and the rest in the form of inactive metabolites. Bisoprolol is the most selective ,-blocker and it is suitable for the suppression of PAF (7).

However, beta-blocking agents have central nervous system effects and can cause common psychiatric syndromes (5%–20%), which have been recognized for a long time (4,5). Delirium associated with ,-blocker use can result in symptoms such as confusion, disorientation, agitation, aggression, and visual and auditory hallucinations. There are documented cases of delirium associated with the use of propranolol, atenolol, metoprolol, carvedilol (8-11).

Bisoprolol is a lipid soluble drug whose penetration to the central nervous system is allowed. Given lipophilicity, bisoprolol could certainly penetrate the central nervous system. Additionally, beta-blocker therapy has common side effects including hypotension and bradycardia, which could result in diminishing cerebral oxygen supplies and reduced cerebral perfusion pressure. In a study conducted with aged hypertensive rats treated with propranolol, it has been showed that cerebral blood flow decreases and cognitive function deteriorates compared to animals treated with captopril (12).Among the well-known side effects of beta-blocker therapy are delirium, hallucinations, sleep disturbances, depression, ataxia, drowsiness, and psychosis (13-15). Beta-blockers are also known to interact competitively with serotonin sensitive adenylate cyclase system known to be involved in pathogenesis of delirium, besides it is related to beta adrenergic receptors (16-18). Another reason that may explain delirium is changes in cholinergic system. Deficiency in cholinergic neurotransmitter reveals delirium symptoms (19). Cholinergic neurons spanning from pons and basal forebrain to the cortex renders the input information of cortical neurons ready. The reduction in acetylcholine level leads to a reduction in frontal cortical perfusion. Hypoglycemia, hypoxia and other metabolic changes can cause changes in the acetylcholine mediative functions (20). Although no anticholinergic effect of bisoprolol is known, advanced age is an important predisposing factor for development of delirium. Loss of cholinergic reserves due to aging is becoming more and more associated with age increase. It has been speculated that cerebral neurotransmitter changes associated with age (especially cholinergic reduction) contributes to the development of delirium (21).

The reasons which made us think that the presented clinical condition is due to bisoprolol is as follows: (1) Our case did not have a previously known systemic disease and long-term used medication, (2) delirium table has developed right afterwards the onset of bisoprolol treatment started for PAF, (3) no other factors that could cause delirium were not detected for the case, (4) the fact that delirium symptoms resolved spontaneously and multiple times without any need to any other treatment after the discontinuation of the medication.

Another thing worth to attention is that our case is 87 years old, as increased age makes patients more vulnerable to the side effects of drugs. Moreover, as patient's age increase, the expectation of positive effects of drugs by the physicians, tend to also amplify the possibility of the adverse effects and any other negative consequences. Our case suggests that bisoprolol should be considered among the medications that could cause or at least associated with delirium. The fact that heart diseases are still the leading group among all diseases also bring up the conclusion that cardiologists should also pay more attention to drug choices in elderly patients.

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