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CORRESPONDANCE
Turkish Geriatrics Society
www.turkgeriatri.org
info@geriatri.org
www.geriatri.dergisi.org
editor@geriatri.dergisi.org

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From The Editor In Chief

Every year in the "NATIONAL ELDERLY RESPECT DAY" a public conference is organized by the Turkish Geriatrics Society. The theme of the conference of this year was "How to communicate with a dementia patient?" and was performed on the 20th March, 2019 in a public community center of a municipality in Ankara.

The report of the activity can be found at the below address:

http://www.turkgeriatri.org/haber_detay?id=75

Regarding the national and international courses; it is a pleasure to announce that, 4th SCIENTIFIC RESEARCHES IN GERIATRICS COURSE will be held in 21st Sept, 2019 in Ankara.
Details about the programme and the trainers can be found at the below address:
http://www.turkgeriatri.org/haber_detay?id=62

And the international 7th GERIATRICS AND GERONTOLOGY COURSE is going to be organized with the valuable support of International Institute on Ageing-INIA, in 2-6 March 2020 in Neva Palace Hotel-Ankara.

The details about the announcement, programme and the scientific board are in the below address:

http://www.turkgeriatri.org/haber_detay?id=61

Prof. Yeşim GOKCE KUTSAL, M.D.
Editor in Chief

EDITORIAL

LONG-TERM CARE FACILITIES FOR OLDER PERSONS IN MALTA: POLICIES, TRENDS, AND CHALLENGES

Prof. Marvin FORMOSA

Department of Gerontology and Dementia Studies, Faculty for Social Wellbeing, University of Malta, Msida MSD 2080, Malta

Phone: 00356 79634015

E mail: marvin.formosa@um.edu.mt

INTRODUCTION

The remit of long-term care covers those services undertaken by others to ensure that people with, or at risk of, a significant ongoing loss of intrinsic capacity can maintain a level of functional ability consistent with their basic rights, fundamental freedoms and human dignity (1). Such services can be provided in various settings ranging from private residences to assisted living housing to specialised facilities which provide accommodation and long-term care as a package to people requiring ongoing health and nursing care due to chronic impairments and a reduced degree of independence in activities of daily living (2). This editorial focuses on long-term care facilities in Malta, which cater for persons aged 60 years or over whose chronic physical and cognitive morbidities necessitate social and health services that are unavailable or unfeasible to provide in the community setting. The Maltese archipelago is a European Union Member State. It consists of three islands - Comino, Gozo and Malta - at the heart of the Mediterranean Sea, 93 kilometres south of Sicily and 290 kilometres north of Libya. Comino is uninhabited, and with Gozo having a mere population of 31,446 persons, leaves Malta as the major island of this archipelago state, with as much as 393,938 residents (2013 figures) (3). Malta gained independence from Britain in 1964 when it also joined the Commonwealth, and became a Republic in 1974. Malta joined the European Union in 2004, and adopted the Euro as its currency in 2008. This article outlines the policies, trends and challenges regarding long-term care facilities for older persons in this country, all of which seek to bring forward improved levels of positive ageing for all residents irrespective of their co-morbidities.

Policies

At end of 2017, 25.1% of the total population, or 119,550 persons, were aged 60-plus in Malta (4) (Table 1). The largest share is made up of women, with 53.4% of the total. Sex ratios for cohorts aged 60- and 80-plus were 87 and 60 respectively.

Public policy on ageing in Malta is governed by the National Strategic Policy for Active Ageing (5). Acknowledging that long-term care facilities are liable to become settings where the needs of the group often take precedence to those of the individual, whereby limitations on privacy, preference for leisure activities, meals and meal-times, provision and access to medical care… have a significant impact on their right to self-determination and independent living, the active ageing strategy put forward three related recommendations: 1-Promoting the autonomy of older adults in their decision-making process to enter a long-term care facility; 2-Establishing procedures supporting the autonomy of older adults in their decision-making process including access to appropriate medical, legal, and community services; 3- Implementing measureable national minimal standards for long-term care, and creating the necessary legislative structure for their regulation (5).

The implementation of the above recommendations commenced in earnest in 2014 and by the end of that year two crucial policy measured were adopted by the government. On one hand, applications for admission to long-term care were no longer accepted unless endorsed by the older person himself/herself. Thus, reversing a trend whereby family members applied on behalf of their older parent and relatives for a place in a long-term facility without neither the latter's knowledge or consent. On the other hand, each public long-term facility initiated a Resident Association, elected democratically by the residents themselves every two years, to liaise between the facilities' management body and the residents as far as the implementation of the social and health care services are concerned. The third recommendation was a more ambitious one and necessitated two key steps. First, the launching of *National Minimum Standards for Care Homes for Older Persons* in 2015 (Box 1) (6), and secondly, the establishment of the Social Care Standards Authority in 2017 as the autonomous body responsible for the standards' enforcement (7).

Box 1

National Minimum Standards for Care Homes for Older Persons

- Standards 1 to 5 concern the home's obligations. Each care home shall provide a written and comprehensive Guide for Residents, which sets out the statement of purpose, the range of facilities, and the terms on which all services are provided in the contract with each resident.
- Standards 6 to 10 relate to health and personal care. Residents' health and personal care shall be based on their specific individual needs and wishes within reason. The care plan should be a dynamic document, which must be reviewed and may be changed regularly according to the assessed needs of the resident.
- Standards 11 to 15 concern daily life and social activities. Older individuals continue to have social, cultural, spiritual, and recreational needs and interests, and therefore should enter a care homes with a wide variety of expectations and preferences.
- Standards 16 to 18 focus on complaints and protection by addressing how residents and/or their relatives and representatives can make complaints about anything that goes on in the home, both in terms of the treatment and care provided by staff and/or the facilities that are available.
- Standards 19 to 26 concern the environment. All new homes shall be constructed in such a way that the living space suits all residents' needs. They shall provide single and double rooms with accessible en-suite showers and toilets.
- Standards 27 to 30 focus on staffing issues. In determining appropriate staffing contingents in all care homes, the regulatory requirement that staffing levels and skills mix are adequate to meet the assessed and recorded needs of the residents.
- Standards 31 to 38 relate to management and administration issues by clarifying the qualities and qualifications required of the persons in day-to-day control of the delivery of care, and how they should exercise their responsibilities.

Table 1. Total population by age (31 December 2017).

Age Groups	Males	Females	Total	% of total pop.	Sex ratio
60+	55,687	63,853	119,550	25.1	87
80+	7,474	12,465	19,939	4.2	60
60-69	29,495	29,840	59,335	12.5	99
70-79	18,728	21,548	40,276	8.5	87
80-89	6,648	10,507	17,155	3.6	63
90+	826	1,958	2,784	0.6	42
All ages	**240,599**	**235,102**	**475,701**	**100**	**102**

Table 2. Licensed long-term facilities / beds for older persons in the Maltese Islands (May 2019).

Long-Term Care Facilities	Facilities /Wards	Licensed Beds
Public long-term care facilities		
Community care homes	9	1,004
Long-term care wards at Gozo General Hospital	2	121
St. Vincent de Paul Long-Term Care Facility	1	1,033
Church-run care homes	14	740
Private care homes	17	2,414
Total	**43**	**5,312**

Table 3. Residents by age and gender at St. Vincent de Paul Long-Term Facility (May 2019).

Age Groups	Males	Females	Total
<59	16	13	29
60-69	34	49	83
70-79	83	137	220
80-89	135	334	469
90-99	45	174	219
>100	0	13	13
Total	**313**	**720**	**1,033**

The upholding of the minimum standards by all long-term care facilities in Malta is presently enshrined in the criminal code, whereby proprietors can be fined or even have their facilities closed down if they do not abide by such benchmarks, though a grandfather's clause of 10 years was inserted for matters relating to the minimum area for single and double rooms.

Trends

Public expenditure on long-term care in Malta is relatively low by European Union standards, 1.1% of GDP compared to the EU-28 average of 1.6%, although the EU-28 median average also amounted to 1.1% (European Commission, 2016). In May 2019, the total number of licensed long-term care facilities for older people numbered 43. The number of licensed beds reached 5,312 - that is, 4.4% of the total 60-plus population (Table 2).

The public sector operates nine long-term care facilities whereby most bedrooms are either single or double occupancy, equipped with an en-suite bathroom and kitchenette, and nurse call facilities. Amenities include air-conditioning, central heating, and telephones in each room; and communal televisions, living and dining rooms, and chapel. Some public long-term care facilities operate through public-private partnerships by having their management, as well as a range of social and health services, contracted to a private company. Another form of public-private partnership sees the government purchasing long-term care beds in private facilities as a strategy to keep public spending in the area to a minimum. As regards financial settlements, all resident of public long-term care facilities contributes either 60% or 80% of their pension and any other income depending upon their dependency status, and hence, the level of social and health care services required. However, residents are not to be left with an income of less than €1,397.62 per annum. At the same time, the public sector also operates two wards in the grounds of the Gozo General Hospital for older persons living in the island of Gozo, as well as a large-scale geriatric hospital, St. Vincent de Paul Long-Term Care Facility (SVP), which includes over a thousand service-users. The number of residents at SVP was 1,033, of whom 720 were females and 313 males. Whilst 29 residents were below the age of 60, the number of residents aged 90-plus numbered 232 (Table 3).

SVP operates as a hybrid between a nursing home and a hospital whereby emphasis is made to support the activities of daily living of all residents, giving particular attention to nutrition, mobility, personal hygiene and social and spiritual activities, and thus, catering to the wellbeing of every resident from a physical, psychological, social and spiritual point of view. The health and social care services at SVP are provided by a myriad of health care professionals and employees that total to around 1,100. Residents contribute 80% of retirement pension and 60% of other income, but always with the proviso that residents are not then left with less than €1,397.62 per annum. SVP also includes an Active Ageing Unit which allows each resident with the opportunity to participate in a myriad of social undertakings (ranging from therapeutic activities, such as book reading, crossword puzzles, and actions which enhance dexterity and reminiscence), and a training centre that provides continuous professional training to all caring and professional staff in person-centred and dementia care. A second category consists of 13 long-term facilities operated by the Church, either run by religious orders or directly by the Archdiocese of Malta. Finally, there were 17 licensed private homes for older persons in Malta. Whilst some homes have been purposely built to meet the needs of older residents, others consist of refurbished hotels and apartments. Daily fees vary greatly and are dependent on a number of factors - namely, the level of dependency of and care needed by the resident, whether he/she resides in single or double occupancy, the range of services one purchases, and whether the facility brands itself either at the luxurious or middle-range

ends. Entertainment activities inside the homes and social outings are also organised, and all private care homes offer respite services and convalescence periods.

Challenges

The launch and upholding of the National Minimum Standards for Care Homes for Older Persons (6) was certainly a watershed moment in the development of long-term care policy in Malta. Through these standards, older residents in care homes are certainly in a better position to experience improved levels of wellbeing despite experiencing far-reaching physical and cognitive challenges. However, there is no doubt that more extensive policy work is required if one wishes to ensure a good life in long-term care facilities. Three policy measures are urgently warranted.

A- Quality in long-term care and incentives for providers to create a 'quality' culture

As reports in the media and research data about poor quality long-term care abounds, there is an increasing impetus on governments to develop better evidence-based approaches to improving the quality of care in long-term care facilities. However, quality is a difficult concept to define and operationalise, and it is no secret that most countries do not systematically collect information on quality. Hence, there are only a few countries which have reached a national consensus regarding which indicators ought to be collected and reported regularly. This needs to be mitigated because such indicators enable policy makers to set benchmarks for providers, perform cross-national comparisons of performance, assist providers to manage care services and workers, and offer consumers better information to make informed decisions. However, such changes will not occur on their own and regulatory bodies need to use the 'carrot' approach by proving providers with incentives to deliver responsible, safe and effective care through, for example, 1) consumer-based initiatives such as those leveraging consumer choice and centredness; 2) performance incentives to encourage and reward providers to deliver higher quality care; and 3), incentives to encourage care co-ordination and integration (2). One strategy which Malta could adopt is for the Social Care Standards Authority to publish reports on long-term care providers along with a grading of their performance relative to their peers.

B- Regulations to safeguard residents from elder abuse

Older persons seeking admission in care homes do so due to their increased vulnerabilities, and hence, it follows that they are at a higher risk of being victims of elder abuse compared to their peers. As a result, Malta requires specific legislation and standard operating procedures to safeguard the rights of long-term care residents as there is in some other countries such as the United Kingdom's White Paper Caring for our future: Reforming care and support which required all long-term care providers to establish a Safeguarding Adults Board and Scotland's Adult Protection and Support Act to mention two prominent ones. Moreover, it is important to ensure that care workers have a legal duty to refer colleagues and relatives in case of witnessed or potential harms or risks to older persons, which can result in the former being banned from working with older people and the latter being castigated by a protection order. This duty to report falls upon individuals - including residents, family relatives and carers, and service providers - who witness incidences or have a concern regarding potential cases of abuse. So far Malta lacks a responsible authority which is mandated to tacked reported cases of abuse, and the police squadron is still unknowledgeable and unskilled to deal with elder abuse in a satisfactory manner. However, the launching of a Commissioner for Older Persons Act in 2014 was a step in the right direction.

C- Financial measures for long-term care

One constant issue in long-term care reforms over

recent years has been the issue of how to provide wider and more equitable access to long-term care services without breaking the bonds of financial sustainability. Whilst some countries opted to raise additional taxes, others increased social insurance contributions to finance new benefits for long-term care. Such choices in fiscal policy were generally justified for yielding instantaneous benefits to the public in relieving them of high personal costs or the need to apply for social assistance when one's personal financial reserves have been depleted. The latter issue is not to be taken lightly since the length of average residency in long-term care is ten years which tends to cost more than one's pension income and/or lifetime assets. However, even countries who have implemented such an increase in tax revenue had to face difficult choices, and many were forced to diminish the range of social and health care services for persons with physical and cognitive challenges. For instance, whilst Sweden tightened its means-testing eligibility when in the past community and residential services were made available on the basis of Swedish citizenship, New Zealand and the United Kingdom decreased their residential care benefits. In this context, Malta requires a future looking strategy on the financing of long-term care that balances its funding as a universal service in parallel with a mix of public and private long-term care insurance.

CONCLUSION

Long-term care is a cross-cutting policy issue that brings together a range of services for persons who are dependent on help with basic activities of daily living. When the cohorts of the baby-boom generation will reach the oldest age groups over the next three decades, demand for long-term care will rise steeply. Since long-term care is closely tied to chronic illness and increasing frailty, a long-standing debate has been whether it should be viewed as a medical or social service. Whilst one may argue about the merits of health over social needs of residents, the consensus is that long-term care requires attention from both sectors. Indeed, many policy makers would label the ability to perform activities of daily living and other functional measures as the key rationale for long-term care facilities. However, a frequent response is that such goals seem contradictory: Improving or slowing the rate of deterioration of health and functional abilities may seem in conflict with a goal of meeting needs for care and assistance. The former sounds more end-results driven, whereas the latter seems compatible with simply addressing problems as they arise. Other goals, such as enhancing social and psychological wellbeing, or maximizing clients' independence and autonomy, reflect a basic commitment to encourage consumers to live in the most integrated and 'normal' community settings possible and to promote a meaningful life according to the individual's own view of what that might mean (8).

A way out of this impasse is to accede that the crux of long-term care policy is the recognition that residents have a right to lead a life of dignity and participate in social and cultural avenues. In Malta, this is enshrined in the Minimum Standards for Care Homes for Older People though, of course, implementing the standards in practice - by ensuring that residents' right to human dignity, self-determination, privacy, quality care, freedom of expression, palliative care and support, and perhaps most importantly, redress are safeguarded - is easier said than done. Indeed, much still needs to be done to enhance the wellbeing and quality of life of residents in long-term care facilities. This requires more than simply the launching of policies, though this is certainly a step in the right direction, and necessitates evidence-based measurement on quality care, incentives for providers to create a 'quality' culture, regulations and standard operating procedures to safeguard residents from elder abuse, and financial sustainable measures to meet the increasing cost of long-term care. It is augured that Malta's future travails in ageing and long-term care policy meets such objectives in the foreseeable future.

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Cem CENGİZ[1]
Dilek OĞUZ[2]

REVIEW ARTICLE

GASTROINTESTINAL HEMORRHAGE AND ITS MANAGEMENT IN GERIATRIC AGE GROUP

Abstract

Approximately 35%-40% of geriatric patients seek medical care for gastrointestinal symptoms at least once a year. At least 1% of the population aged over 80 years is hospitalized each year due to gastrointestinal hemorrhage. Gastrointestinal hemorrhage is frequently observed in this population and associated with high mortality and morbidity. Also, gastrointestinal hemorrhage is one of the main causes of hospitalization among geriatric patients. Geriatric patients with GIH constitute a subgroup of patients requiring special care in hospitals. The bleeding may occur in the upper or lower gastrointestinal tract and manifest itself with a variety of symptoms depending on its location. The incidence and natural course of hemorrhage are affected by antiplatelet and anticoagulant medications. The outcome of gastrointestinal hemorrhage in geriatric patients depends largely on the characteristics of bleeding lesion and comorbidities.

Keywords: Geriatrics; Gastrointestinal hemorrhage; Aged

CORRESPONDANCE
Dilek OĞUZ
Kırıkkale University, Faculty of Medicine, Department of Gastroenterology, Kırıkkale, Turkey.

Phone: +903182251000
e-mail: ddkoguz@yahoo.com

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[1] TOBB University of Economics and Technology, Faculty of Medicine, Department of Gastroenterology, Ankara, Turkey.
[2] Kırıkkale University, Faculty of Medicine, Department of Gastroenterology, Kırıkkale, Turkey.

DERLEME MAKALE

GERİATRİ YAŞ GRUBUNDA GASTROİNTESTİNAL KANAMA VE TEDAVİSİ

Öz

Geriatri yaş grubundaki hastaların yaklaşık %35-40'lık bir kısmı, yılda en az 1 kez gastrointestinal semptomlar nedeni ile tıbbi yardıma ihtiyaç duymaktadır. Seksen yaş üstü nüfusun en az %1'i, her yıl gastrointestinal kanama nedeni ile hastaneye yatmak zorunda kalmaktadır. Gastrointestinal kanaması olan geriatric olgular, hastanelerde özel bakım gerektiren hasta grubunu oluşturmaktadır. Geriatrik çağda gastrointestinal kanama sık gözlenmektedir ve beraberinde yüksek morbidite ve mortalite riski taşımaktadır. Kanama üst veya alt gastrointestinal sistemden köken alabilir ve kanama lokalizasyonuna göre semptom çeşitliliği gösterebilmektedir. Kanamanın insidansı ve klinik seyri, hastanın kullandığı antiplatellet veya antikoagülan tedaviden etkilenmektedir. Geriatrik olgulardaki kanamanın seyri çoğunlukla kanayan lezyonun karakteristiğine ve eşlik eden hastalık olup olmamasına bağlıdır.

Anahtar sözcükler: Geriatri; Gastrointestinal hemoraji; Yaşlı

INTRODUCTION

At least 1% of the population aged over 80 years is hospitalized each year due to gastrointestinal hemorrhage (GIH). Gastrointestinal hemorrhage can be caused by age-specific lesions or lesions that are observed in all age groups. Mortality or morbidity depends on the characteristics of the bleeding lesion, the presence of comorbidities, and medication use. GIH-causing lesions can develop because of comorbidities or can be initiated by medications used to relieve the effects of aging. Gastrointestinal hemorrhage incidence increases with age, and elderly patients constitute a subgroup of patients requiring special care in hospitals (1).

UPPER GASTROINTESTINAL HEMORRHAGE

Despite the decline in the total incidence of non-variceal upper GIHs since the 1990s, there has been an increase in the number of patients aged over 60 years (2). Approximately 70% of patients seeking medical attention for GIH are aged over 60 years with the incidence of hemorrhage increasing with age. Advanced age is a significant risk factor for mortality following GIH because of the increased prevalence of pulmonary and cardiovascular diseases in this population (3).

Etiology

Despite the advancements in the diagnostic and treatment techniques for GIH, mortality rates remain unchanged, the primary reason being the steadily increasing elderly population. The elderly (at least 60 years of age) are prone to GIH, and excessive use of NSAIDs in elderly patients is one of the primary causes of GIH (4). In addition, elderly patients comprise 44.5% of the GIH patients and 75% of GIH-originated mortality (5).

Many studies have been conducted on the etiology of upper gastrointestinal bleeding among elderly (1-10). The causes of upper gastrointestinal hemorrhage are the same across all age groups. Peptic ulcer is the primary cause in both elderly and young patients, and the other most frequent causes of GIH are esophagitis, esophageal ulcer, gastropathy, gastric and esophageal varices, Mallory-Weiss tear, and malignancy (Table 1).

Clinic and laboratory

For elderly patients admitted with upper GIH, a detailed medical history should be obtained, including information regarding prior surgeries, prior GIH, medications used, comorbidities, NSAIDs use, and the use of drugs for neurological disorders (e.g., Parkinson's and Alzheimer's diseases). The presence of a chronic liver disorder should be evaluated and detailed by physical examination. Laboratory results should be urgently and consistently assessed, and the determination and replacement of acute blood loss should be the primary goal. Moreover, a treatment plan should be developed according to the clinical results that are obtained following admission. Total blood count, coagulation parameters, and evaluation of electrolyte imbalance are all critical tests following which additional tests, such as a liver function test, can be performed to enable physicians to detect underlying disease. Hypotension is an important indicator of a higher risk of mortality and blood loss in elderly patients with peptic ulcer hemorrhage (6).

Notably, 40%–50% of patients with GIH have hematemesis, 75%–80% have melena, and 15%–20% have hematochezia. Medical history and physical examination results have prognostic value. Indeed, advanced age, a positive tilt test, and shock symptoms indicate a poor prognosis, and cases with these symptoms have high mortality. An increase in comorbidities related to the cardiovascular system, central nervous system, gastrointestinal system (GIS), hepatic system, pulmonary system, renal system, and physiological stress increase mortality rates (7).

The color of feces depends on the transit time and the amount of blood in the GIS. Hematochezia sometimes reflects ulcer hemorrhage and fast transit time which are good indicators of hemodynamic

Table 1. Etiology of upper gastrointestinal bleeding among elderly (1, 10).

Etiology	Kaplan	Thomopoulos	Farrell
Peptic ulcer disease (%)	73	48	24
Eosophagitis, EU	11	-	15
Gastropathy	7	7.2	29
Esophagial-Gastric varices	11	13.2	23
Mallory Weiss	3	-	11
Upper GI Malignancy	1	-	5

instability. Interestingly, 71% of patients with upper GIH have melena, but mortality rates are lower compared to those having hematochezia (9.4% vs. 13.6%). In cases with negative upper GIS on endoscopy, colonoscopy remains the most appropriate tool for evaluating melena. Melena is observed in 18% of patients with lower GIS hemorrhage (8).

Treatment of upper gastrointestinal hemorrhage

The patient's hemodynamic condition should be the primary parameter to be evaluated. Additionally, the presence of tachycardia, a pulse rate over 100–120 beats/min, hypotension (blood pressure lower than 90 mm Hg), incidences of syncope, findings of shock, and blackout require immediate resuscitation of the patient.

The severity of the hemorrhage must be evaluated, and the clinical status of the patient must be determined (e.g., using the Glasgow and Rockall coma scores, the APACHE II score, and the Child-Pugh score). Specifically, the Rockall coma score combines general and endoscopic symptoms (Table 2) (7) and predicts mortality and rehemorrhage using a risk scoring system.

The patient's blood volume loss should be detected according to the methods mentioned above, and the patient should be hemodynamically resuscitated. Compared with young patients, elderly patients are less tolerant to anemia and hypoxia. Therefore, in the presence of cardiac comorbidity, mortality would significantly increase in elderly patients if they are not promptly treated. Blood volume deficiency must be rapidly replaced using plasma, erythrocyte suspension, or other plasma volume expanders.

Continuous infusion of 8 mg/h proton pump inhibitor (PPI) therapy following 80 mg i.v. bolus of PPI (esomeprazole, omeprazole, or pantoprazole) can improve endoscopic stigmata and can accelerate platelet aggregation in the stomach by increasing intragastric pH. Esophagogastroduodenoscopy (EGD) should be performed when the patient is hemodynamically stable to detect hemorrhage and bleeding lesion, and should be endoscopically treated. An endoscopic examination should be performed imminently because the observed symptoms influence the treatment required. The significant complication rate because of endoscopy is 0.5%, whereas the mortality rate is 0.13%. However, an EGD can provide information on the localization of bleeding up to the ligament of Treitz and information on the activity and rebleeding risk of peptic ulcers according to the Forrest classification (Table 3) (8).

Table 2. Rockall score (7).

Parameter	0	1	2	3
Age	<60	60-79	≥80	
Shock	None BP >100 HR <100	BP >100 HR <100	BP <100	
Co-morbidity	No major	CCF, IHD	Renal or liver failure	Metastatic malignancy
Diagnosis	M-W tears, no lesion	All other diagnoses	Upper GI malignancy	
Signs of recent bleed	None or dark red spot		Blood in upper gut Adherent clot Visible vessel	

CCF:Congestive Cardiac Failure, IHD:Ischemic heart disease, M-W:Mallory-Weiss

BP:Blood-Pressure, HR: Heart rate

Score <2: Rebleeding 4%, mortality < 0-1% , Score >5: Rebleeding 24%, mortality >11%

In hemodynamically-stabilized patients, endoscopic procedures can be performed for Forrest Ia, Ib, IIa, and IIb ulcers. Currently, endoscopic treatments for peptic ulcer bleeding involve the use of a sclerosing agent, adrenaline injection, thermal coagulation, endoscopic clipping, or a combination of these procedures. However, in several rare hemorrhages (e.g., Dieulafoy's lesion and gastric antral vascular ectasia hemorrhages) and in esophagus/stomach variceal bleeding, endoscopic treatments also involve tissue adhesives, band ligation, and argon plasma coagulation.

If the endoscopic treatment is unsuccessful or if the hemorrhage cannot be adequately controlled during subsequent endoscopy, radiological or surgical treatments should be considered, and surgical consultation should be performed for these patients. Additionally, multidisciplinary evaluation of the patient should be conducted with radiology and other departments as appropriate.

Once the hemorrhage is controlled, the underlying illnesses should be appropriately treated. Treatments may include *Helicobacter pylori* (Hp) treatment, eradication of esophageal and fundal varices, specific treatment (if possible) for hepatic diseases, treatment of esophagitis, and argon plasma coagulation in telangiectasia. Notably, long-term treatment programs for elderly patients appear to be crucial in preventing rebleeding.

LOWER GASTROINTESTINAL HEMORRHAGE

Despite the incidence of lower GIH being lesser than upper GIH, it certainly does increase with age. Lower GIH refers to hemorrhages below the ligament of Treitz. Several studies have shown a 200-fold increase in the incidence of lower GIH from the third to the ninth decade of life. The average age of patients with lower GIH is 63-77 years. The reason for an increased incidence of lower GIH with age is because of increased risk of diverticular hemorrhage, which is the most common cause of lower GIHs in elderly individuals. Compared with younger individuals, elderly individuals have to endure extended hospital stay and higher treatment expenditure (9). There is no difference between the diagnostic approach for lower GIH

Table 3. Forrest classification (8).

Acute hemorrhage	Signs of recent hemorrhage	Lesions without active bleeding
Ia: Spurting Hemorrhage	II a : Visible vessel	III: Lesions without signs of recent hemorrhage
Ib: Oozing Hemorrhage	II b: Adherent clot	
	II c: Hematin on ulcer base	

and that for other GIHs (i.e., evaluating the status of the patient and identifying the hemorrhage). Once the patient is stabilized, the procedure for the determination of the etiology and treatment is the same as that for upper GIH.

Etiology

Concerning factors for lower GIH are vascular ectasia, diverticular disease, malignancy, ischemic intestinal disorders, and anorectal diseases in patients aged over 50 years. Vascular ectasia and diverticular disease constitute 60% of major GIHs, with vascular ectasia being the most common cause. Postpolypectomy bleeding, radiation proctitis, and solitary ulcer are also rare causes of lower GIH in geriatric population. (Table 4) (1,10).

Clinical symptoms and diagnosis

Obtaining a detailed medical history is critical in lower GIH patients to evaluate possible etiologies. Blood color, presence of hematochezia or melena, and volume of blood loss may help to locate the hemorrhage. Blood in the feces usually indicates anorectal hemorrhages. In addition to upper GIH, melena may also indicate hemorrhage in the proximal colon. Abdominal pain with cramps and rectal bleeding can indicate inflammatory bowel disease. If the patient is hemodynamically stable, a sudden onset of painless bleeding is a typical indicator of diverticular hemorrhage. Vascular dysplasia hemorrhages can involve a broad spectrum of bleeding, from occult to severe. Depending on the type of bleeding, flexible sigmoidoscopy may be performed after colonoscopy.

Treatment of lower gastrointestinal bleeding

Diverticulosis coli

Despite studies showing right colon diverticula to be the primary source of diverticular hemorrhage, it can originate from any segment of the colon. Interestingly, 80% of cases occur in elderly individuals. In most studies, diverticulosis is reported to be the most common source of colonic and in the majority of cases bleeding stops spontaneously although it can sometimes be severe (11). Treatment plan includes flexible sigmoidoscopy/colonoscopy and endoscopic treatment (i.e., adrenaline injection, thermal coagulation, and band ligation). Radiological diagnosis and treatment should be considered when the endoscopic approach fails. Multidetector CT/CT angiography and Tc-99m sulfur colloid scintigraphy can assist in locating the bleeding. Once the location of the hemorrhage is identified, selective mesenteric angiography with embolisation can be used to occlude the bleeding vein. Nevertheless, intermittent hemorrhage prevents an easy diagnosis. Surgery is required only in a small proportion of patients, and is typically an elective surgery. Emergent surgery has a high rate of mortality in elderly patients with a study reporting mortality of 37% in patients aged over 70 years (12).

Table 4. Etiology of lower gastrointestinal bleeding among elderly (1,10).

Etiology	Kaplan (%)	Farrell (%)
Diverticular bleeding	23	52
Angiodysplasia	7	12
Hemorrhoids	-	12
Neoplasm	12	-
Inflammatory bowel disease	14	6
Colitis	-	35
Ischemic colitis	-	-
Infectious colitis	-	-
Drug induced colitis	-	-
Undefined etiology	41	-

Ischemic colitis

Typically, ischemic colitis results from a reduction in colonic blood circulation or dehydration. The risk for ischemic colitis increases with age, especially in patients with comorbidities, such as vasculitis, or in those who use diuretics or vasoactive agents.

The clinical symptoms typically include an abdominal pain with cramps and the appearance of thickened colon wall on abdominal CT. Colonoscopy shows fragile, inflammatory, mucosal, and submucosal bleeding structures in the affected region, and ischemic colitis must be distinguished from mesenteric and chronic ischemia by the presence of acute emboli. Hemorrhage rarely causes hemodynamic problems in patients with ischemic colitis; however, stenosis can occur between attacks, and the patients typically present with obstructive symptoms. Additionally, in ischemic colitis secondary stenosis should be considered in patients who have obstructive symptoms.

Vascular dysplasia

Vascular dysplasia is a frequent source of apparent or occult hemorrhage in elderly patients. They are generally located in the small intestine but have also been reported in the colon; however, the involvement of the right colon is rare . The clinical spectrum varies from chronic occult to acute massive bleedings (13). It is often difficult to reach the lesions in the small intestine and balloon enteroscopy can be used for this purpose. Endoscopic, angiographic, and surgical treatment is possible for a single, massively bleeding vascular dysplasia located in the cecum. The primary endoscopic treatment is argon plasma coagulation; however, the treatment choice depends on the technical capabilities and the expertise level of each center. Heat application by using a heater probe was a popular procedure in the past; however, argon plasma coagulation is the first choice of treatment due to its higher success rates.

Hemorrhoids

The prevalence of hemorrhoids decreases after the age of 65. However, patients who had chronic constipation during their youth continue to experience hemorrhoids as they advance in age (14). Hemorrhoids can cause a variety of hemorrhages, from a small number of fresh rectal bleeds to massive bleeding. They are best evaluated by performing a retroflexion technique in the rectum. Typically, hemorrhoids cause low-volume bleeding, and treatment (e.g., medical or surgical) depends on the complication.

Stercoral ulcer and solitary rectal ulcer

Both stercoral and solitary rectal ulcers can cause massive rectal bleedings (15). Notably, a large percentage of patients with hemorrhagic ulcers are aged over 60 years. Stercoral ulcer originates from mucosal trauma in the rectum caused by petrified feces, whereas solitary rectal ulcer evolves following prolapse of the rectal mucosa because of constipation and rupture. If active bleeding from the ulcer is detected, the endoscopic treatments used for peptic ulcer can be used to treat stercoral and solitary rectal ulcers.

Colon tumors and postpolypectomy hemorrhages

Typically, colon tumors cause occult bleeding, but they can also cause overt hemorrhages. Bleeding can occur following polypectomy in the early or late phase. Several studies documented that different techniques were available to prevent post-polypectomy bleeding. These techniques include injectable solutions, placement of endoclips, deployment of a detachable loop, and application of thermal energy (with coagulation forceps or argon plasma coagulation) as well as a combination of these techniques Additionally, aspirin and anticoagulant use should be regulated (16).

Radiation proctitis

Radiation proctitis occurs in patients with prostatic, genitourinary, and gynecologic malignancies who underwent radiotherapy. Symptoms may occur years after the therapy and it can cause overt bleedings that require chronic transfusion. Endoscopic measures especially argon plasma coagulation (APC) are effective and safe. Treatment includes formalin application, sucralfate enema, and hyperbaric oxygen application are other treatment alternatives; however, data regarding the success of these various treatments other than APC is scant. Surgery is considered for refractory or severe cases. (17).

OCCULT/OBSCURE HEMORRHAGES

A diagnosis of occult or obscure hemorrhage should be made when the location of the hemorrhage cannot be detected on either upper endoscopy or colonoscopy. Occult hemorrhages occur mainly because of an inability to locate lesions during the initial endoscopy or intermittent bleeding that make diagnosing hemorrhage challenging (18). Endoscopy should be repeated, and angiography and scintigraphy results should be evaluated in case of occult hemorrhages. The location of the hemorrhage can also be the small bowel, which was considered to be a blind spot until recently. In such cases, push jejunoscopy, balloon enteroscopy and capsule endoscopy can help physicians locate the source of the hemorrhage.

The diagnostic capability of capsule endoscopy in occult hemorrhages has been reported to be 58%–80%. Vascular dysplasia, bleeding tumors of the small bowel, and ulcers because of NSAIDs use that have been frequently detected in recent years can be diagnosed using capsule endoscopy. Comparative studies have shown the superiority of capsule endoscopy over push enteroscopy, small bowel enteroclysis, and mesenteric angiography (19). Swallowing disorders and delays in gastric emptying in elderly patients can create problems for the passage of capsule to the small bowel

ultimately requiring endoscopic aid. Capsule use is inappropriate in patients with a suspicion of intestinal obstruction. In addition to recent developments in capsule technology, ongoing research is focusing on improving battery life and image quality.

Both single and double balloon enteroscopy have enabled visualization and treatment of small bowel illnesses by using endoscopic procedures. The diagnostic efficiency of balloon enteroscopy in occult hemorrhage cases is noted to be 60%–67% (20). Despite its advantages over other techniques (e.g., the possibility of argon application to treat vascular dysplasia and the suitability to use endoscopic applications), it is an invasive technique, and the targeted area cannot always be reached.

NSAIDS AND GASTROINTESTINAL HEMORRHAGE

Aspirin use increases the risk of upper GIH (21), and the addition of a nonaspirin antiplatelet agent or NSAID also increases the risk of hemorrhage. Similarly, concurrent use of aspirin and NSAIDs increases the risk of lower GIH, particularly of diverticular hemorrhage (22). Interestingly, the use of both aspirin and NSAIDs in elderly patients with cardiovascular and rheumatologic illnesses increase the risk of both lower and upper GIH. Therefore, it is crucial to determine the GIH risk in patients who are required to use aspirin. The hemorrhage history of the patient and illnesses and drugs that predispose patients to hemorrhages should be delineated, and minimal cardiac protection should be maintained by using the smallest possible dose of aspirin. The long-term hemorrhage risk because of aspirin use can be reduced using a PPI. NSAIDs are significant risk factors of GIH during hospitalization. Aspirin or selective COX-2 inhibitor use and peptic ulcer history were found to be predictors of upper GIH in patients hospitalized with hip fractures. Prophylactic H2 receptor blocker or PPI usage reduced the risk of GIH during hospitalization (23).

RELIABILITY OF ENDOSCOPY

The reliability of endoscopy has been observed throughout the general population. The mortality rate of elective EGD has been determined to be 0.0004%, whereas the mortality rate of endoscopies performed during hemorrhage is 0.01% (24).

Lower and upper endoscopic procedures have similar success and mortality rates for the entire population. Most studies dealt with elective endoscopy performed for surveying. Mortality and morbidity of elderly patients during endoscopy depend on the severity and magnitude of the bleeding and comorbidities. Procedure-related perforation and complications due to premedication are the most significant causes of mortality and morbidity. Zenker's diverticulum and anatomical deformities (cervical eminentia) are among the most critical causes of perforation during endoscopy in elderly patients. Perforations during a colonoscopy performed to detect lower GIHs occur because of excessive looping, a relaxed venter, hernia, previous operations, colon shrinkage, and adhesions. These perforations are significant predictors of mortality and morbidity during endoscopy for lower GIH.

Sedation during all endoscopic procedures is a crucial problem for elderly patients. Typically, in elderly patients, benzodiazepines and other anesthetic substances are used in smaller amounts compared to that in young patients of similar height and weight. Also propofol has a longer recovery time in elderly patients when compared with sedation with a combiation of midazolam and fentanyl (25). Additionally, patients should be adequately monitored during sedation to detect changes in oxygen saturation, blood pressure, pulse rate, and carbon dioxide levels.

CONCLUSION

Acute hemorrhages require evaluation and stabilization of general health condition before endoscopy in elderly. The factors affecting the course of hemorrhage, comorbidities, and medication should be promptly evaluated. Endoscopy can be performed in geriatric patients as safely and efficiently as in younger patients; however, each case should be individually assessed for risk factors.

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REVIEW ARTICLE

FORENSIC AGE ESTIMATION IN GERIATRIC AGE GROUP

Abstract

In the geriatric population, forensic age estimation could be essential for insurance-related issues, retirement processes, and work permits. Although cases of forensic age estimation are dominant in adolescents and early adults, nowadays the practice of forensic age determination is increasing in the geriatric population as well.

Forensic age estimation, in living and deceased individuals, is among the most commonly studied topics in clinical forensic medicine. However, only few studies have been performed for age estimation in the geriatric population. Based on skeletal bone morphology, skeletal bone radiological traits, chronological dental changes, facial traits, degenerative processes, and automated systems, there are several methods for forensic age estimation in adults and partly in the geriatric population. This paper aims to the draw attention of health-care professionals by discussing methods used for forensic age estimation in the geriatric population.

Keywords: Geriatrics; Age determination by skeleton; Forensic Medicine

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- Ramazan AKÇAN[1]
- Yıldırım Mahmut ŞERİF[2]
- Ali Rıza TÜMER[1]

CORRESPONDANCE

Ramazan AKÇAN
Hacettepe University, Faculty of Medicine, Department of Forensic Medicine, Ankara, Turkey.

Phone: +903123052004
e-mail: akcanmd@hotmail.com

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[1] Hacettepe University, Faculty of Medicine, Department of Forensic Medicine, Ankara, Turkey.
[2] Afyonkarahisar University, Faculty of Medicine, Department of Forensic Medicine, Afyonkarahisar, Turkey.

DERLEME MAKALE

GERİATRİ YAŞ GRUBUNDA ADLİ YAŞ TAYİNİ

Öz

Geriatrik yaş grubunda adli yaş tayini özellikle sigorta ilişkili sorunlarda, emeklilik süreçlerinde ve çalışma izni sağlanması sırasında gerekli olabilmektedir. Her ne kadar adölesan ve erken erişkinlere yönelik adli yaş tayini çalışmaları halen yaş tayini alanındaki olguların çoğunluğunu oluştursa da; günümüzde geriatrik adli yaş tayini talepleri de giderek artmaktadır.

Hem yaşayan, hem de ölmüş olgularda adli yaş tayini klinik adli tıp alanında sık çalışılan konulardan birisi olarak karşımıza çıkmaktadır. Ancak geriatrik yaş grubunda adli yaş tayinine yönelik çok az sayıda çalışma bulunmaktadır. İskelet morfolojisi, kemiklerin radyolojik değerlendirmelerine dayanan yöntemler, yaşla ilişkili dental değişiklikler, yüz özellikleri, dejeneratif süreçlerin değerlendirilmesi ve otomatize sistemler erişkinlerde ve kısmen de geriatrik popülasyonda kullanılan yöntemler arasında sayılabilmektedir. Bu yazıda, geriatrik popülasyonda adli yaş tayinine ilişkin literatürde sunulmuş olan yöntemlerin tartışılması ile bu alanda çalışan profesyonellerin dikkatlerinin çekilmesi amaçlanmaktadır.

Anahtar sözcükler: Geriatri; Kemik yaşı tayini; Adli Tıp

INTRODUCTION

Forensic age estimation, in living and deceased individuals, is one of the most studied topics in the field of clinical forensic medicine. However, in the literature, the majority of studies related to age estimation deal with adolescents and early adults, most probably because of the higher case number due to legislations regarding criminal capacity (1).

Forensic age estimation is a necessity when a proper birth certificate is missing and/or birth registration is claimed or suspected to be incorrect. In Turkey, according to the Civil Law numbered 5490, each birth event has to be recorded by Population and Citizenship Affairs officers with a proper birth certificate. In case of missing documents related to birth, the actual date of birth needs to be investigated and approved by legal authorities, which consequently becomes a case for forensic medicine professionals. A majority of the forensic age estimation cases include immigrants, citizens born abroad, and those who are subjected to age-related medicolegal issues.

In the geriatric population, forensic age estimation may be essential for insurance-related disagreements, work permits, and retirement procedures. The issues related to refugees who lack a birth certificate or an identity report stating the exact birth date and the need of refugees to be evaluated in terms of age estimation for several procedures are increasing in most European countries. Although the majority of forensic age estimation cases are related to adolescents and early adults, nowadays cases in the geriatric population are also steadily increasing. This increase might strongly be attributed to the increase in refugee population due to war or conflicts in the Middle East. Thus, it is assumed that forensic age estimation in the geriatric population seems to be relatively increasing due to problems or procedures regarding work permit/retirement and insurance policies toward immigrant/refugee population.

This paper aims to draw attention of professionals to a rarely studied topic and discuss methods with potential use in forensic age estimation in the geriatric population.

FORENSIC AGE ESTIMATION

Forensic age estimation is an important topic for expert witnesses, including forensic medicine specialists, pediatricians, orthopedic surgeons, endocrinologists, radiologists, and anthropologists. Medical reports issued by these professionals guide legal authorities in pursuit of justice.

Forensic age estimation in living individuals have three basic requirements; a) obtaining a complete medical history, including metabolic, endocrine, and skeletal system diseases; medication use history; nutrition style, if specific; skeletal trauma history, b) performing a physical examination before radiological imaging, and c) performing dental examination (2). Further, the data on the profession of the individual, daily routine, and history of sports activities are highly important.

The aim of forensic age estimation in living individuals differs with age groups. For children, adolescents, and early adults, the most common aim is to assess whether the individual is a child or an adult according to the childhood age limit (18 years) set by World Health Organization. This assessment is highly important, especially for child pornography cases, human trafficking cases, and the determination of criminal responsibility/child delinquency for those involved in a crime as a suspected criminal or victim. However, for adult and geriatric age groups, the most common aim is to correct false age in documents (3).

Age estimation may be crucial for penal and civil lawsuits. In penal lawsuits, determining the age of perpetrators and victims during the case is essential. Turkish Penal Code article number 31 arranges minors' situations against penal lawsuits

with legal age limits of 12, 15, and 18 years. Importantly, legal sanction varies according to the age group of offenders. According to Turkish Penal Code article number 82 (intentional murder victims), article number 94 (torture victims), and article number 102 (sexual abuse victims), the duration of punishment increases for perpetrators in crimes against minors. Therefore, in such cases, respondent (defense authority) claims that victims are older than they appeared, and therefore, such situations require forensic age estimation of victims.

Children, adolescents, and early adults comprise the vast majority of cases of forensic age estimation. There are several methods for the estimation of age of individuals who are in the first two decades of their lives. Further, these methods are well established, as accurate as possible, frequently studied, and validated for different populations (4).

Overwhelming majority of forensic age estimation cases in the geriatric population is required for civil lawsuits. Further, forensic age estimation may be essential for insurance-related disagreements, retirement procedures, and work permits in elder population. There are different age restrictions for work permits and retirement procedures in Turkish Civil Code similar to many other countries. According to the Civil Law numbered 5434, the maximum age limit to be an employee in different occupations differs between 41 and 67 years, and individuals with age greater than these limits are not allowed to work in certain jobs. The same law determines the minimum age of retirement as 38 years for women and 40 for men. However, these limits differ between 38 and 60 years of age for different occupations. Another need for forensic age estimation in the geriatric population may arise in lawsuits regarding compensation for disabilities due to faulty actions of another individual by any means. In such cases, the amount of compensation is calculated based on the expected life span of the victim. Therefore, it is essential to calculate the remaining life span of the victim so as to calculate the exact amount of compensation. It is also crucial to know the exact age of the individual, during the event, to calculate the remaining life span, duration of working years, and duration for retirement.

The war in the Middle East has affected many countries and started a refugee crisis mainly influencing the neighborhood. Health-care and forensic professionals have been facing new problems that they are unfamiliar with, of which one is the increasing numbers of forensic age estimation cases in all age groups (5). According to the Turkish Ministry of Interior and European Commission, Turkey, being a neighboring country of the war region, is one of the most affected countries, which had to handle over 3.7 million refugees from Syria. This crisis resulted in various age-related issues, e.g., children could not be integrated into the education system because of their unknown age and adults and elderly individuals had job- and retirement-related problems due to the social security system. Therefore, an urgent need arises for validated forensic age estimation methods in living individuals of all age groups.

Although there is still dominance of adolescents and early adults among forensic age estimation cases, nowadays the practice of forensic age determination in the geriatric population is increasing due to previously described causes. As the number of refugees without proper birth certificates increases in the society, the number of cases related to forensic age estimation in the geriatric population will also increase because of the abovementioned requirements.

Similar to those used in other age groups, methods used for forensic age estimation in the geriatric population might basically be categorized into methods based on skeletal characteristics, dental methods, and experimental methods.

METHODS BASED ON SKELETAL CHARACTERISTICS

There are several studies on developmental or degenerative skeletal characteristics in terms of forensic age estimation, in deceased and living individuals. However, most of the methods are concerning about adolescents and early adults since criminal laws and legislations about asylum seekers are especially concentrating in these age groups in many countries.

Işcan method is one of the methods focusing on the estimation of age in adults and partly in the geriatric population. This method evaluates the shape of the osteochondral junction of the fourth rib, which changes from "V" to "U" shape with increasing chronological age. This method describes eight phases of osteochondral junction, in which the eighth phase indicates individuals of age ≥51 and ≥62 years in males and females, respectively (6,7).

Another method introduced by Suchey and Brooks evaluates and classifies the developmental or degenerative changes of pubic symphysis into six separate phases (8). Depression due to ongoing erosions on symphyseal surface of pubis occurs in the sixth phase, which indicates an age range of 42–87 and 34–86 years in females and males, respectively, with 95% confidence interval (8).

Lovejoy et al. stated that auricular surface of the iliac bone may show "nongranular and irregular" surface as a result of destruction/degeneration and is considered as a sign indicating approximately 60 years of age (9). After two decades, Buckberry and Chamberlain revised the method introduced by Lovejoy et al. (9,10). Their study suggested seven phases with respet to changes in auricular surface of the ilium with a score system that evaluates transverse organization, texture, apical changes, microporosity, and macroporosity of the surface. In this method, the sixth phase indicates an age range between 39 and 91 years with a median age of 66 years, whereas the seventh phase indicates an age range between 53 and 92 years with a median age of 73 years, with 95% confidence interval (10). Later, another method was developed, which evaluates sacral vertebral body fusion, microporosity, macroporosity, surface texture, apical changes, S1 vertebra ring fusion, and coccygeal fusion, thereby subdividing the chronological changes into six phases. In this method, the fifth phase indicates an age range between 21 and 81 years, whereas the sixth phase indicates an age range between 35 and 91 years, with 95% confidence interval (11). However, a study from Portugal claimed that the chronological characteristics of acetabulum and auricular surface of the ilium has power to determine ages up to 60 years (12).

Kunos et al. (13) described a number of chronological changes and their use in cases of forensic age estimation. Digangi et al. (14) also introduced another method, which indicates 37–89 years of age with 95% confidence interval if the individual has the highest scores in geometric shape of the costal face and surface texture of the tubercle facet of the first rib.

Although there are studies regarding the age estimation for skeletal remains, predictive values of these methods in the geriatric population is still controversial (15). Further, a common problem in these methods, as pointed out by Meritt (16), is neglecting weight or body mass that potentially affects the chronological changes evaluated in age estimation and provides erroneous results.

A valid method to determine skeletal age of living individuals in the geriatric population is not available because the majority of studies dealing with skeletal age estimation in geriatric population focus on the identification of human remains. Similarly, a detailed radiological assessment of various skeletal chronological changes, such as osteophytic changes, osteopenia, osteoporosis, cartilage degeneration, degenerative osteoarthritis, and other degenerative signs may be useful in the age estimation of living individuals in geriatric population (17). However, there

are many interfering factors, including genetic conditions, diseases, trauma history, nutrition, and exercise habits (18,19).

Radiological atlas-assisted forensic age estimation is a widely used method for living individuals. However, commonly used and relatively validated methods, including Greulich–Pyle, Tanner–Whitehouse, and Gök methods focus on subadults. Although Gök atlas reveals criteria for the assessment of bone age estimation in adulthood, it still does not present any information on the chronological changes in individuals >50 years of age. Atlas-assisted methods have also been recently criticized for lacking population differences, which might result in erroneous age estimations even in pediatric populations (1).

In the literature, a number of studies deal with magnetic resonance imaging and computerized tomography for the assessment of the skeletal bones to estimate age in adulthood (20,21). However, further investigations with a larger group are required to develop more accurate methods specific to different age groups, including the geriatric population.

DENTAL METHODS

For decades, dental age estimation methods based on different combinations of tooth, pulp, pulp chamber, and root ratios and other time-dependent changes or characteristics on dental structure have been widely studied in the literature. There are two main dental methods that are widely used for forensic age estimation in the geriatric population for living individuals and corpses (22–26). Kvaal's and Cameriere's methods are based on pulp, tooth, and root length ratios, which can be determined using mesial and apical X-ray images (27). Further, Cameriere et al. (27) stated that their method could be applicable with automated image processing systems. On the other hand, Lamendin's method is based on periodontosis and translucency ratios with root lengths (24). Lamendin's method is thought to be more accurate in terms of age estimation compared to many other methods. However, Marroquin et al. stated that repeatability is better and the overall standard estimations are lower in Kvaal's method in comparison with volumetric studies (23).

The determination of dental aspartic acid racemization amounts is another method, which is less practical than other dental methods because it requires a sensitive chromatographic analysis (28).

Although there are several studies dealing with dental age estimation, there is still no method that potentially determines forensic age accurately in the geriatric population. Therefore, professionals suggest that different dental and/or skeletal methods should be combined to achieve more reliable results (4).

OTHER METHODS

Facial traits

Facial characteristics may be useful in age estimation, although it is highly subjective. Estimations of age based on facial characteristics have been studied in the literature not only for forensic purposes but also for understanding cognitive perceptions about age and esthetic processing of the human brains (29). Facial traits, including facial lines, facial growth, skin elasticity, tooth loss, senile hyperkeratosis, racial differences, cherry angiomas, and chronological ocular changes, may help to assess age as well as distort perception about an individual's age (30,31).

Histological methods

Histological methods to determine age are mainly focused on the bone and bone marrow histomorphology. There are studies about chronological changes of the osteon structure and cellularity of bone marrow in the literature. However, none of these studies revealed a validated method although the topic has been studied for decades.

Image-based systems

Image-based evaluation systems have been attracting attention in the last decade. These methods are basically objectified and justified facial trait assessment using software. The method is of great value for individuals who have full facial photographs at proper time intervals (32,33).

Gynecological methods

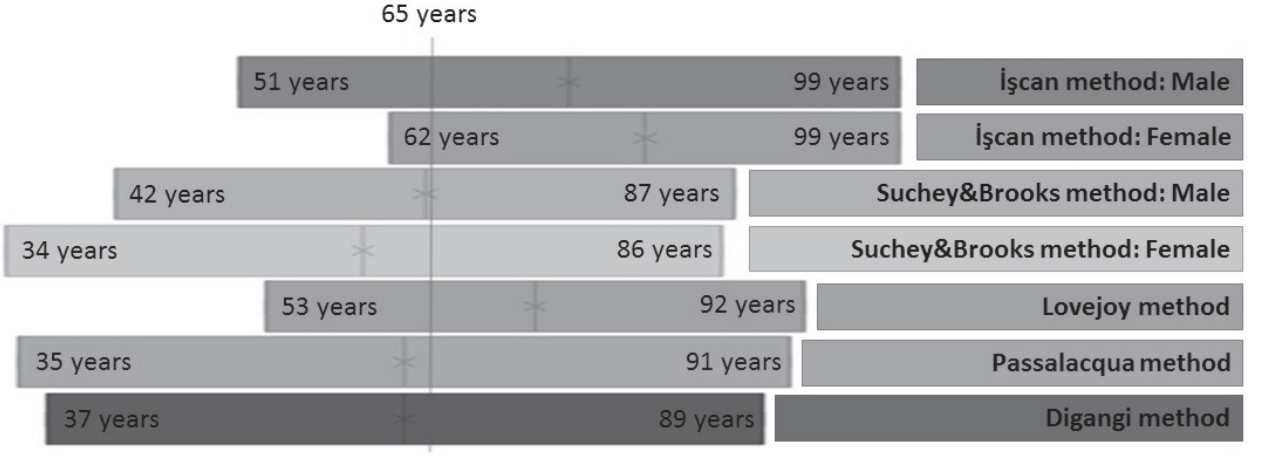
In a case presentation, gynecological examination and the assessment of reproductive hormone levels were used to determine the age of an immigrant in Italy, as a supportive method to dental age estimation (34).

CONCLUSION

Forensic age estimation is one of the most studied topics in the field of age estimation. However, the number of studies dealing with the geriatric population is low and the presented data are relatively inadequate. Although there are few methods to assess age in the geriatric population, they have to be improved. Methods based on bone age estimation reveal a wide range of age instead of an exact age, whereas and dental methods might be of no use because of possible tooth loss in geriatric individuals. Estimated age intervals involving geriatric in respect of utilized method is shown in Figure 1.

Being a relatively rare topic of discussion in the past, age estimation methods in the geriatric population might be an open discussion topic and an attractive study area in near future due to the increasing population of immigrants and refugees and related problems. Thus, more well-established methods are required for forensic age estimation in the geriatric population with the validation of previously described methods in different genetic pools.

Figure 1. Estimated age intervals involving geriatric in respect of utilized method.



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RESEARCH

SYNERGISTIC EFFECT OF FRAILTY AND MALNUTRITION ON POSTOPERATIVE FIRST-MONTH MORTALITY AND DELIRIUM STATUS AMONG GERIATRIC AGE GROUP PATIENTS WITH HIP FRACTURES

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Emrah CALIŞKAN[1]
Özgur DOĞAN[1]

Abstract

Introduction: We aimed to determine the effect of preoperative frailty status and malnutrition on delirium and first-month mortality during the early postoperative period in patients aged >65 years with hip fractures.

Materials and Method: In total, 56 (44 female and 12 male) patients operated for hip fractures were prospectively analyzed. Clinical frailty scale was used to determine the preoperative frailty status. Nutritional Risk Screening 2002 scores were measured to examine the risk of malnutrition status. The 4 "AT" test was conducted for the diagnosis of delirium. Mortality rates were determined in the postoperative month 1.

Results: Of the total, 29 (51.8%) patients were found to be frail, 22 (39.3%) were found to be prefrail, and 5 (8.9%) were found be nonfrail. Further, 34 (60.8%) patients were at the risk of malnutrition. Additionally, 38 (67.8%) patients had delirium and 8 (14%) patients died during the postoperative month 1. Although Nutritional Risk Screening 2002 scores positively correlated with first-month mortality, no correlation was found between malnutrition and delirium status. A positive correlation was found between clinical frailty scale score and delirium; however, there was no correlation between clinical frailty scale score and first-month mortality. Positive predictive values of malnutrition and frailty together for first-month mortality increased up to 54.5% from 17.6% and 13.6 and that of delirium increased to 80.2% from 54.5% and 72.4%, respectively.

Conclusion: Morbidity and mortality rates can be reduced after hip fractures by detecting frailty and malnutrition together and taking necessary preoperative precautions in the elderly.

Keywords: Geriatrics; Age determination by skeleton; Forensic medicine

CORRESPONDANCE

Emrah CALIŞKAN
Ankara Numune Training and Research Hospital, Orthopedics and Traumatology Clinic, Ankara, Turkey.

Phone: +903125084000
e-mail: dremrahcaliskan@gmail.com

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[1] Ankara Numune Training and Research Hospital, Orthopedics and Traumatology Clinic, Ankara, Turkey.

ARAŞTIRMA

KIRILGANLIK VE MALNÜTRİSYON BİRLİKTELİĞİNİN KALÇA KIRIĞI OLAN GERİATRİ YAŞ GRUBU HASTALARIN BİR-AYLIK MORTALİTE VE DELİRİUM DURUMLARINA ETKİSİ

Öz

Giriş: Kalça kırıklarında mortalite ve morbiditeyle sonuçlanan faktörler halen tartışılmaktadır. Bu çalışmanın amacı preoperatif kırılganlık ve malnutrisyon durumunun; kalça kırığı gelişen 65 yaş üzerindeki kişilerde, delirium ve bir-aylık mortalite üzerine etkisini belirlemektir.

Gereç ve Yöntem: Kalça kırığı nedeniyle opere edilmiş, ortalama yaşı 79.4 (aralık 65-95 yıl) yıl olan 56 (44 Kadın/12 Erkek) hasta prospektif olarak incelendi. Preoperatif kırılganlık durumunun tespiti için klinik kırılganlık skalası kullanıldı. Malnutrisyon durumunu anlamak amacıyla Nutrisyonel Risk Taraması-2002 skorları hesaplandı. Delirium tespiti için 4AT testi uygulandı. Mortalite yüzdeleri postoperatif birinci ayda belirlendi.

Bulgular: Klinik kırılganlık skalasına göre 29 (51.8%) hasta kırılgan, 22 (39.3%) hasta kırılganlık-öncesinde ve 5 (8.9%) hasta kırılgan değildi. Nutrisyonel Risk Taraması-2002 skoruna göre 34 (60.8%) hasta malnutrisyon riski altındaydı. 4 AT testine göre 38 (67.8%) hastada delirium gözlendi. Postoperatif 1. ayda mortalite 14% (8 patients) idi. Nutrisyonel Risk Taraması-2002 skoru ile bir aylık mortalite ile pozitif korelasyon varken, delirium ile malnutrisyon arasında ilişki bulunamamıştır (p=0.49). Klinik kırılganlık skalası ile delirium arasında pozitif korelasyon bulunmuşken (r= 0.46, p=0.018); bir aylık mortalite ile ilişkisi tespit edilememiştir (p=0.59). Malnutrisyon ve kırılganlık birlikte değerlendirildiğinde pozitif prediktif değeri bir aylık mortalite için sırasıyla %17.6 ve %13.6'dan %54.5 e yükselmiştir; delirium içinde pozitif prediktif değer 54.5 ve 72.4%'den %80.2 ye artmıştır.

Sonuç: Yaşlı hastalarda kalça kırığı durumunda preoperatif kırılganlık ve malnutrisyonun birlikte tespiti ve gerekli önlemlerin alınması ile morbidite ve mortalite yüzdeleri düşürülebilir.

Anahtar sözcükler: Kırılganlık; Malnütrisyon; Mortalite; Delirium

INTRODUCTION

The annual rate of increase in hip fractures varies from 1% to 3% with an incidence of 1.6 million/year, which is estimated to be 6.3 million/year by 2050. In operated hip fractures, the mortality rate is 30% during year 1, whereas in nonoperated hip fractures, it is 90%. One-year mortality is doubled in patients who are rehospitalized for any reason within the first 30 days. In the last 10 years, there was a 41.2% increase in the number of rehospitalizations during postoperative month 1 after hip fractures. Hip fractures are one of the most common causes of hospitalization in the geriatric population (1).

The prevalence of malnutrition is high (between 30% and 60%) in hospitalized geriatric patients (2). Malnutrition in surgical patients is associated with increased complications, poor outcomes, and increased mortality. Visvanathan et al. found an association between malnutrition and muscle dysfunction, cognitive dysfunction, increased fall risk, prolonged hospitalization, morbidity, and mortality (3). Similarly, Norman et al. also found a close association between malnutrition and morbidity and mortality and prolonged recovery time in patients with hip fractures (4). Preoperative albumin levels, total lymphocyte counts, Mini Nutritional Assessment, and Nutritional Risk Screening can be used to determine the nutritional status. Nutritional risk screening is recommended in patients undergoing surgery (5).

Frailty is a common geriatric syndrome that is clinically recognized and characterized by a decline in physiological reserves and function across multiple organ systems. This condition makes the elderly more vulnerable to adverse health issues. Chen et al. stated that frailty can be used for the risk assessment of patients scheduled to be operated (6). Johnson et al. argued that determining the frailty index is an important clinical marker prior to deciding for surgery (7). Modified frailty index, Fried frailty index, and clinical frailty scale (CFS) have been frequently used indices to determine the frailty status (7). Although there is a correlation between frailty and malnutrition, this association is not fully understood in cases of hip fractures.

The increase in the survival rates results in advancement in the incidence of hip fractures. Advances in living standards, surgical techniques, and implant technologies have increased patient expectations. However, clarification of the predictive causes of morbidity and mortality in hip fractures may help to meet increased patient demands. In this study, we aimed to determine the preoperative frailty and nutritional status in geriatric patients with hip fractures and to study the effects of these two conditions on postoperative first-month mortality, delirium, and other complications.

MATERIALS AND METHOD

Ethical approval was obtained from the local ethical committee (Decision number IDF: 2337/18). This prospective study included the patients in the geriatric age group (>65 years) who were admitted to orthopedic clinics with the diagnosis of intracapsular or extracapsular hip fracture and had undergone surgical intervention between January 2017 and October 2017. Patients with multiple and pathological fractures were excluded. The patients who were previously diagnosed with dementia were also excluded from the study after consultation with the patient and their relatives. Demographic characteristics [age, sex, and body mass index (BMI)], comorbidities (hypertension, diabetes, coronary heart diseases, renal failure, and chronic obstructive pulmonary diseases), dominant extremity, polypharmacy status, mechanism and site of fracture, and ambulatory status were preoperatively determined. The handgrip strength of each patient was measured by the same physician thrice using a dynamometer (Baseline® hydraulic hand dynamometers), and the average value was considered. The American Society of Anesthesiologist scoring, type of anesthesia, operation time, implant used, blood transfusion requirement, and complications were

intraoperatively recorded. In the postoperative period, the length of hospital stay and postoperative first-month mortality and morbidity were determined. In addition, renal markers [glomerular filtration rate (GFR)] and hemoglobin levels were recorded preoperatively and at 24 and 72 h of the postoperative period.

The status of delirium and cognitive functions of patients were also recorded during the hospital stay using the 4 "AT" test, which is an assessment test for delirium (8). This test comprises the following parameters: alertness (0–4 point), abbreviated mental test 4 (0–2 point), attention (0–2 point), and acute change or fluctuating course (0–4 point). The test was applied to the patients preoperatively and on postoperative days 1, 3, and 7, if they were not discharged from the hospital. Accordingly, patients with a score of ≥4 have possible delirium ±cognitive impairment, those with a score of 1–3 have possible cognitive impairment, and those with a score of 0 have no delirium.

Nutritional Risk Screening 2002 (NRS-2002) analysis was performed at the hospital to determine the status of nutrition. The test starts with an initial screening. If the answer to any of the four questions asked in the initial screening test is yes, then the final screening is performed. After the addition of 1 point for patients aged ≥70 years, patients who scored ≥3 in the final screening were considered to be at a risk of malnutrition. Patients who did not undergo the final screening or scored <3 points, including the final screening score, were not accepted as at the risk of malnutrition. Turkish version of this test was validated (9). Evaluation of this test was made within the first 24 hours after admission.

CFS was used to determine the frailty status of patients (10, 11). Face-to-face evaluations were performed with patients and their family members. CFS was determined on a scale of 1 (very fit)–9 (terminally ill), wherein the patient should be in one category, and is focused on clinical judgment. Each point on this scale concurs with a written description of frailty, complemented by a visual chart to identify the classification of frailty. Category 2 refers to "well" for people who have no active disease symptom but are less fit than category 1. Category 3 refers to "managing well" for people whose medical problems are well controlled and are not regularly active beyond routine walking. Category 4 refers to "vulnerable" people who do not need daily help; however, symptoms often limit their activities. Category 5 refers to "mildly frail" people who often have more evident slowing and need help in daily livings. Category 6 refers to "moderately frail" people who need help with all outside activities. Category 7 refers to "severely frail" people who are completely dependent for personal care. Category 8 refers to "very severely frail" people completely dependent for personal care and approaching the end of life. The patients who met the first three criteria were termed as nonfrail, those who met the fourth criterion were termed as prefrail, and those who met the fifth–ninth criteria were termed as frail. Assessments took place within 24 hours of the admission, and the Turkish version of this test was validated (12).

All the patients were evaluated by the same physician. He also performed all of these three tests that were designed to be used by any health professional at first contact with the patient and convenient for use in daily clinical practice. These tests are practical and simple to conduct and no special training is required.

Statistical analysis was performed using the SPSS software 21.0 (IBM, Illinois, USA). The variables were investigated using visual and analytical methods to determine if they were normally distributed or not. Frailty, malnutrition, and delirium test results were not normally distributed; therefore, nonparametric tests were conducted to compare these parameters. Mann–Whitney U-test was used to compare results between these parameters, and the correlation coefficients and their significance were calculated using the Spearman test. For multivariate analysis, possible factors identified with univariate analyses were further entered into the logistic regression

analysis to determine independent predictors. A 5% type-I error level was used to infer statistical significance. Power analysis was performed where a sample size of 52 patients would provide 80% power with a 95% confidence interval (CI) on any differences between study groups.

RESULTS

A total of 56 patients (44 female and 12 male) were operated for isolated hip fracture, and the mean age was 79.4 years (range, 65–95 years). Fracture was detected in the right hip in 22 (39.2%) patients and left hip in 34 (60.8%) patients. The mean BMI was 25.2 kg/m^2 (range, 13–40 kg/m^2). Smoking was detected in 9 (16%) patients. The reason for trauma was ground level fall in majority of patients [44 (78.5%) patients], and most of the patients [32 (57.1%) patients] could be mobilized without any support. The mean handgrip strength was 15 (range, 5–30) (Table 1). The mean preoperative hemoglobin (Hb) values were 11.8 [8.8–15.6, standard deviation (sd)=2.3], and the mean postoperative Hb values were 10.1 (8.1–13.3, sd=1.9) (p=0.426). The mean preoperative GFR was 56 (7–105, sd=12.3), and the mean postoperative GFR was 42 (6–84, sd=14.8) (p=0.064). At least 1 out of 26 postoperative complications were seen in 18 (32%) patients. Complications are summarized in Table 2. Postoperative first-month mortality rate was 14% (8 patients). According to the 4 "AT" test, 38 (67.8%) patients had delirium, 11 (19.7%) patients had cognitive impairment, and 7 (12.5) patients showed no delirium. The median time for duration of delirium was 1.3 (range, 0–3 days) days.

According to CFS, 5 (8.9%) patients were nonfrail, 29 (51.8%) were frail, and 22 (39.3%) were prefrail. The mean NRS-2002 score was determined as 4.2 (range, 0–7) with 22 (39.2%) patients scoring <3 points and 34 (60.8%) patients at a risk of malnutrition. There was a positive correlation between frailty and malnutrition (rho=0.36, p=0.026). The mean NRS-2002 score was 1.9 for nonfrail patients and 4.8 for frail patients (p=0.018) (Table 3).

Postoperative complications were found to be higher in patients with NRS-2002 score >3 points in multivariate logistic regression analysis, even when performed considering age, sex, weight, and smoking parameters [odds ratio (OR), 3.89, 95% CI, 1.92–7]. At the same time patients in the group of risk of malnutrition, according to the NRS-2002 score, positively correlated with the first-month mortality (rho=0.064, p=0.035). The positive correlation was found between length of hospital stay and NRS-2002 score (rho=0.18, p=0.038). There was no correlation between malnutrition and preoperative and postoperative delirium (p=0.49). Although a positive correlation was found between CFS score and postoperative complications (rho=0.12, p=0.021), length of hospital stay (rho=0.73, p=0.028), and postoperative 4 "AT" test (rho= 0.46, p=0.018), there was no correlation with mortality (p=0.59) (Table 4).

The positive predictive values (PPVs) of malnutrition and frailty for mortality were 17.6% and 13.6%, respectively; however, when patients with scores of NRS-2002 > 3 and CFS > 4 were taken into consideration, PPV for mortality increased to 54.5%. Moreover, PPV for delirium increased to 80.2%, showing the combination of malnutrition (52.6%) and frailty (72.4%) (Table 5).

DISCUSSION

Hip fractures are associated with increased morbidity and mortality in the geriatric population. Although the effects of preoperative malnutrition and frailty status of patients on morbidity and mortality were separately evaluated, to our knowledge, there is no information about the effects of the association of both factors on postoperative first-month mortality and delirium.

Frailty is closely related to mortality and clinical functions in patients with hip fractures. Different tests have been used in previous studies to determine the frailty index. In their prospective study of 179 geriatric patients, Gregorovic et al. found that

increased frailty with respect to CFS was associated with increased mortality and decreased functional results for 3 months (13). Similarly, Basic et al. found a positive correlation between the frailty status of geriatric patients hospitalized due to an acute disease determined using CFS and the predicted in-hospital mortality [OR=2.97 (2.11–4.17)], new nursing home placement [OR=1.60 (1.14–2.24)], and length of hospital stay [hazard ratio=0.87 (0.81–0.93)] (14). Kua et al. compared two frailty scoring systems modified Fried criteria and reported Edmonton frail scale (REFS) in their study that comprised 100 geriatric patients with hip fractures. They declared that REFS was a good predictor of postoperative results and also for 6 months of basic activities of daily living (15). In our study, postoperative morbidity and length of hospital stay positively correlated with frailty; conversely, there was no correlation with first-month mortality. The reasons for this might be that CFS was used for determining frailty status and only first-month mortality rates were investigated. Long-term mortality rates or various frailty scoring systems may result in different outcomes.

In their study on 215 geriatric patients operated for hip fractures, Koren-Hakim et al. advocated that the Mini Nutritional Assessment-Short Form (MNA-SF), Malnutrition Universal Screening Tool, and NRS-2002 test can be used for the diagnosis of malnutrition (16). However, they argued that only MNA-SF can be used to predict mortality and readmission. Although the Mini Nutritional Assessment is often used to evaluate malnutrition, it is time-consuming and not recommended for patients with mental status. For this reason, the European Society for Clinical Nutrition and Metabolism developed the NRS-2002 evaluation test. In their studies, Anthony and Kondrup et al. recommended NRS-2002 for predicting mortality in hospitalized patients (5,10). In addition, Ozkalkanli et al. found that NRS-2002 was superior to the subjective global assessment in terms of predicting complications in patients undergoing orthopedic surgery (17). We used NRS-2002 as a marker of nutritional status in our study. Although mortality, postoperative morbidity, and hospital stay correlated with malnutrition, there was no correlation with both preoperative and postoperative delirium. Similarly, Ozbilgin et al. found a positive correlation between mortality and NRS-2002, which was used as a nutritional assessment tool in a postoperative intensive care unit, but could not detect a correlation with delirium (18). Ringaitien et al. found that patients undergoing coronary artery bypass surgery with the risk of malnutrition status, according to NRS-2002, were more likely to have postoperative delirium ($p < 0.0191$) (19). The difference in patient population and surgical intervention might have affected the outcome of our study. At the same time, the use of the Confusion Assessment Method for Intensive Care Unit for the detection of postoperative delirium may explain different results from our study.

Although there was a correlation between malnutrition and first-month mortality, we could not find any correlation between frailty and first-month mortality. In case of delirium, the opposite results were true; there was a positive correlation with frailty but not with malnutrition. However, when examined together, they synergistically act to create a powerful index for the prediction of both mortality and delirium. Patients who were both frail and had the risk of malnutrition showed a 54.5% chance of postoperative first-month mortality and 80.2% had the possibility of delirium. Therefore, detection of frailty and malnutrition together may give clearer results for predicting delirium and first-month mortality.

Low handgrip strength (<27 kg for men and <16 kg for women) is a component of sarcopenia that was defined according to the consensus of the European Working Group on Sarcopenia in Older People (20). In addition to low handgrip strength, polypharmacy has also been shown as a contributing factor for sarcopenia. Kimura et al. found that polypharmacy is significantly common among patients with sarcopenia compared to those without sarcopenia ($p=0.004$) (21). Polypharmacy

increases with aging and it is reported to be among the causes of sarcopenia, as well as malnutrition (22). Although 32.1% of our patients have polypharmacy, and low mean handgrip strength was observed among female patients. sarcopenia screening was not performed in our cohort, and this can be considered as a limitation of the study because sarcopenia is a contributor to the development of frailty. Although frailty is a geriatric syndrome that displays significant overlap with sarcopenia, it represents a much broader concept than sarcopenia.

The relatively lower number of patients in our study may be considered as a limitation. However, prospective and long-term follow-ups of geriatric patients are extremely difficult in daily practice. In geriatric patients with hip fractures, several parameters affect morbidity and mortality, which may have affected the results. However, in our prospectively designed study, these parameters were attempted to be standardized as much as possible. A questionnaire filled by the physician was used to determine the malnutrition status. The study could be improved by adding laboratory parameters, such as albümin levels and total lymphocyte counts, and anthropometric data. However, questionnaire is the frequently used nutrition survey for the detection of malnutrition in daily practice in hospitalized patients, which was validated by various studies. Postoperative surgical complications, such as implant failure, nonunion, and malunion, were not analyzed. Our study was planned for the postoperative first-month period. Therefore, previously mentioned complications, which were considered long-term, were not followed so as to minimize variables that would affect the results in the early period. Although it is among the most widely used clinical test for delirium internationally, the Turkish version of 4"AT" test was not validated yet, which was also another limitation of the study. Although cognitive impairment was determined by the 4"AT" test, general cognitive status assessment was not studied.

In conclusion, because the predetermination of hip fractures is not possible in daily practice, it is important to determine the preoperative nutritional and frailty status of patients in terms of postoperative outcomes. The treatment of hip fractures with a multidisciplinary approach and treatment of malnutrition and frailty together in perioperative period will decrease postoperative complications and early mortality. At the same time, examining preoperative risk factors in patients with hip fractures may permit doctors to predict possible outcomes and inform their relatives in advance.

Table 1. Characteristics of the patients.

Variable	n (%)
Gender*	
Male	12 (21.5)
Female	44 (78.5)
Age	79.4 (range, 65-95)
Body Mass Index (mean,sd), kg/m²	25.2 (range 13-40)
Mechanism of injury	
Ground level fall	44 (78.5%)
Fall from height	7 (12.5%)
Traffic accident	3 (5.3%)
Other	2 (3.7%)
Pre-injury functional status*	
No assistive device	32 (57.2%)
Cane	10 (17.8%)
Rolling Walker	8 (14.3%)
Wheelchair	5 (8.9%)
Transfers only	1 (1.7%)
Handgrip (kg)	
Female	10 (range, 5-25)
Male	30 (range, 10-60)
Polypharmacy*	
≤4	38 (67.9%)
>4	18 (32.1%)
Type of fracture*	
Intracapsular	30 (53.6%)
Extracapsular	26 (46.4%)
Length of hospital stay (day)	8.2 (range, 3-26)
ASA score	
2	6 (10.7%)
3	34 (60.7%)
4	16 (28.6%)

*Number of patients; ASA: the American society of anesthesiologist scoring

Table 2. Analysis of postoperative complications.

Variable	n (%)
Acute kidney injury	8 (14.6)
Myocardial infarction	2 (3.5)
Acute Respiratory Distress Syndrome	1 (1.7)
Stroke	1 (1.7)
Pneumonia	2 (3.5)
30-day readmission	3 (5.3)
Deep vein thrombosis-pulmonary embolism	6 (10.6)
Surgical site infection	3 (5.3)

Table 3. Comparison of frailty phenotypes with certain variables.

Variable	CFS			
	Non-frail	***Pre-Frail***	***Frail***	***p***
Number of patients	5 (8.9%)	22 (39.3%)	29 (51.8%)	0.025
NRS-2002 score	1.9	4.2	4.8	0.008
4-AT test score	2.3	3.8	7.6	0.017
Mortality rate (number)	3 (5.3%)	2 (3.5%)	3 (5.3%)	0.542
Handgrip (kg)	22	18	12	0.043
Polypharmacy (>4 drug use)	5	5	8	0.086
Type of fracture				
Intracapsular	13 (23.2%)	7 (12.5%)	10 (17.8%)	0.436
Extracapsular	6 (10.7%)	12 (21.4%)	8 (14.2%)	0.074

CFS: clinical frailty scale; NRS-2002 score: nutritional risk screening-2002 score; 4-AT test: assessment test for delirium

Table 4. Comparison of malnutrition with certain variables.

Variable	NRS-2002		
	<3	*3 and more*	*p*
Number of patients	22 (39.2%)	34 (60.8%)	0.041
CFS score	2.8	5.2	0.008
4-AT test	2.4	3.1	0.245
Mortality rate (number)	2	6	0.012
Handgrip (kg)	17	14	0.209
Polypharmacy (>4 drug use)	10	8	0.455
Type of fracture			
Intracapsular	12	18	0.024
Extracapsular	11	15	0.37

NRS-2002 score: nutritional risk screening-2002 score, CFS: clinical frailty scale, 4-AT test: assessment test fordelirium

Table 5. Comparison of malnutrition with certain variables.

Variable				
Variable	**Sensitivity (%)**	**Spesicificity (%)**	**Pozitive Predictive Value (%)**	**Negative Predictive Value (%)**
NRS-2002>3	75	41.6	17.6	90.9
CFS>4 (Frail)	37.5	60.4	13.6	85.2
NRS-2002 >3 and CFS>4	75	89.5	54.5	95.5
Delirium				
Variable	**Sensitivity (%)**	**Spesicificity (%)**	**Pozitive Predictive Value (%)Value (%)**	**Negative Predictive Value (%)**
NRS-2002 >3	47.7	11	52.6	9
CFS>4 (Frail)	42.4	66.5	72.4	35.4
NRS-2002 >3 and CFS>4	44.2	77.8	80.2	40

NRS-2002 score: nutritional risk screening-2002 score; CFS: clinical frailty scale

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■ Ayşegül ILGAZ [1]
■ Ayşe AKGÖZ[1]
■ Sebahat GÖZÜM[1]

RESEARCH

VALIDITY AND RELIABILITY OF THE TURKISH VERSION OF THE SOCIAL INCLUSION SCALE

Abstract

Introduction: This study aimed to adapt the Social Inclusion Scale (SIS) to a Turkish population and test its reliability and validity.

Materials and Method: In total, 230 older persons aged ≥65 years participated in methodological research conducted in Antalya, Turkey. In the validity section, factorial construct and content validity analyses were used. To determine the reliability of the scale, internal consistency and item analyses were used.

Results: Cronbach's alpha of the scale was 0.894, indicating high reliability. The item-total correlations ranged 0.28–0.70. The content validity index was 0.97. The factor loadings of 18 items of SIS loading on three factors varied between 0.40 and 0.79, accounting for 55.14% of the variance.

Conclusion: SIS was found to be a reliable and valid tool for defining social inclusion levels in the older persons aged ≥65 years.

Keywords: Social participation; Social isolation; Aged; Loneliness; Reproducibility of results; Turkey

CORRESPONDANCE

Ayşe AKGÖZ
Akdeniz University, Faculty of Nursing, Department of Public Health Nursing, Antalya, Turkey.

Phone: +905435403091
e-mail: ayse.dgstn1@gmail.com

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[1] Akdeniz University, Faculty of Nursing, Department of Public Health Nursing, Antalya, Turkey.

ARAŞTIRMA

SOSYAL DAHİL OLMA ÖLÇEĞİNİN TÜRKÇE GEÇERLİK VE GÜVENİRLİK ÇALIŞMASI

Öz

Giriş: Bu çalışmada, sosyal dahil olma ölçeğinin Türk kültürüne uyarlanması ve geçerlik güvenilirliğinin test edilmesi amaçlanmıştır.

Gereç ve Yöntem: Antalya'da yürütülen bu metodolojik araştırmaya 65 yaş ve üzeri toplam 230 yaşlı birey katılmıştır. Geçerlik bölümünde faktör yapı ve içerik geçerliliği kullanılmıştır. Sosyal dahil olma ölçeğinin güvenilirliğini belirlemek için içtutarlılık ve madde analizi kullanılmıştır.

Bulgular: Ölçeğin Cronbach alfa değeri 0.894 bulunmuştur. Ölçek yüksek güvenilirlik göstermektedir. Madde toplam korelasyonu ise 0.28-0.70 arasında bulunmuştur. Kapsam geçerlik indeksi .97'dir. Üç faktöre yüklenen sosyal dahil olma ölçeğinin 18 maddelik faktör yükleri.40 ile.79 arasında değişmektedir ve varyansın %55.14'ünü açıklamaktadır.

Sonuç: Sosyal dahil olma ölçeği, yaşlılarda sosyal dahil olma düzeyini tanımlamak için güvenilir ve geçerli bir araç olarak bulunmuştur.

Anahtar sözcükler: Sosyal katılım; Sosyalizolasyon; Yaşlı; Yalnızlık; Sonuçların tekrarlanabilirliği; Türkiye

INTRODUCTION

According to the European Union, social inclusion is defined as full participation in economic, social and cultural life and the acquisition of resources and opportunities permitting a normal standard of living. At the same time, the term references access to fundamental rights and the ability to make decisions affecting the lives of individuals. Under the European Union definition, the aims of a social inclusion policy are to prevent or eliminate social exclusion and ensure participation and integration in all fields of economic and social life. Social exclusion, the contradictory concept of social inclusion, has been considered in many studies (1). Social exclusion is the inability to participate in similar activities as the vast majority of the population because of a lack of resources, rights, goods and services and maintain normal relationships with other people (2). A prior study identified seven different dimensions of social inclusion/exclusion in older persons, namely social relations (e.g. communication with family and friends or business status), cultural and leisure activities (e.g. cinema, going to the theatre), citizenship activities (e.g. society, membership, voting, voluntary work), basic services (health and social services), neighbourhood (e.g. security and friendship associations), and financial situation (e.g. immovable property, central heating) (3).

Social inclusion includes aspects such as friendship experiences, emotions and physical (housing), psychological (belonging sensation), social (friendship) and leisure factors (leisure time) (4). Whereas social inclusion affects both mental health and physical health in a positive manner, proper mental health reduces illness and promotes healing (5). Social inclusion has a key role in increasing mental health and well-being by guiding community-based health activities (6). A UK study found that community-based services and activities for older persons living in rural areas increase their social inclusion (7).

Problems experienced by older persons (including access to health services, transportation, financial support and other services supporting psychosocial well-being) have been incorporated into social inclusion policies in Ireland and the UK (8). Because of the increase in mental health problems among the older persons, participation in social activities has decreased, and the importance of social inclusion has emerged (9). With the growing population of older persons in Turkey, loneliness among them has increased, whereas social inclusion has decreased, leading to mental health problems in this population.

In a study conducted in the UK, participation in arts courses and health projects improved the well-being and social inclusion of individuals with mental health problems (10). It is necessary to evaluate social inclusion and implement supportive measures to improve the social health of individuals with poor mental health. The 'Multidimensional Perceived Social Support Scale' has been used to evaluate social health in the literature, but no Turkish scale evaluating social inclusion has been developed (11). The Leisure Activities Scale was used to determine social participation levels in a study conducted to identify the factors affecting social participation among older persons living at home (12). No gold standard for measuring social inclusion has been established (9). To protect and improve the mental health of at-risk older persons, it is necessary to clarify the mechanisms by which individuals perceive social inclusion and take necessary precautions.

This study sought to clarify the validity and reliability of the Social Inclusion Scale (SIS), which is used to determine the social inclusion status of older persons aged ≥65 years, by adapting it to a Turkish population.

MATERIALS AND METHOD

This psychometric study was conducted at three family health centres (FHCs) in Antalya, Turkey. The centres are located in three different regions with different socioeconomic levels. The socioeconomic levels of the older persons aged ≥65 years were

assessed using the socioeconomic status assessment scale (SES). When the samples taken from these three regions were evaluated by SES, the levels were found to be different from each other (X^2=47.671, p<0.05).

The study consisted of individuals aged 65 years and older who are registered at FHCs in three different regions of Antalya (Kepez, Konyaalti and Muratpasa). In methodological studies, it is recommended that the sample size should exceed the number of items (variables) by 5–10-fold to test the validity and reliability of measuring instruments (13). As the SISconsisted of 22 items, the targeted sample size was 110–220 people, and ultimately, 230 individuals were enrolled. The inclusion criteria were being aged ≥65 years, having no diagnosesof psychiatric diseasesand willingness to participate. For selection of the sample population, older persons who applied to FHCs for any reason and meet the inclusion criteria were included in the study.

Age, gender, education, income level and occupation were recorded to determine sociodemographic characteristics. Chronic illness, the degree of dependency (Barthel index), living arrangements and the level of loneliness (Loneliness Scale for the Elderly [LSE]) were questioned to determine the factors influencing social inclusion. The SIS was used to assess the mental health of older persons aged ≥65 years.

To determine the socioeconomic levels of participants in the study, the SES developed by Kuppuswamy in 1976 and revised and adapted into the Turkish language by Avşar in 2010 was employed. Cronbach's alpha for the scale was 0.89 (14). In the SES scale, education, occupation and monthly income were separately classified, and the sum of these variables determined each individual's SES class. In accordance with these three variables, SES classes are identified with five levels: upper, upper medium, medium, lower-medium and lower levels.

The LSE, which was developed by Gierveld and Kamphuis (1985) to measure feelings of loneliness, was revised by Tilburg and Gierveld in 1999 (15). The Turkish validity and reliability study of the scale were confirmed by Akgül and Yeşilyaprak in 2015 (16). A three-point Likert-type scale with 11 items consisted of two sub-scales: emotional loneliness (items 2, 3, 5, 6, 9 and 10) and social loneliness (items 1, 4, 7, 8 and 11). Loneliness can be divided into four levels according to the score. Hence, '0–4 points' are classified as not feeling loneliness, '5–14 points' are classified as feeling acceptable loneliness, '15–18 points' are classified as feeling very lonely and '19–22 points' are classified as feeling very intense loneliness. The score the scale ranged 0–22, with higher scores indicating greater loneliness. The Cronbach alpha of the scale was 0.85 (16).

The SIS, which was developed by Secker et al. in 2009, consists of 22 items (9). This scale includes three sub-scales, namely social isolation, social relations and social acceptance. Two items on the scale are included in two sub-scales because they fit into both sub-scales. As three items of the scale do not fit into any sub-scale, they are handled separately as 'individual items' without being included in the sub-scales (9).

This Likert-type scale uses answers of 'not at all' (1 point), 'not particularly' (2 points), 'yes a bit'(3 points) and 'yes definitely' (4 points). But four items (1., 10., 11. and 16. items) are the reverse coded items. These items' answers of 'not at all' (4 point), 'not particularly' (3 points), 'yes a bit' (2 points) and 'yes definitely' (1 points). Minimum and maximum scores are 18 and 72 points for SIS. The SIS measures an individual's relationship with other people over the last month, and higher scores indicate greater socialisation. Cronbach's alpha for all items was 0.85, and the values for the social isolation, social acceptance and social relations sub-scales were 0.76, 0.76 and 0.70, respectively.

Because SIS, consisting of 22 items, was originally developed to assess mental health, one of these items is not appropriate for the older persons. For this reason, the wording of one statement has been changed; specifically *'I have felt some people look*

Table 1. Demographic characteristics of participants and effect on SIS scores (n=230).

Variable	n(%)	Median (min–max)	p
Age groups (years)			
65–74	154(67.0)	56.0 (28–71)	
75–84	63(27.4)	48.0 (22–71)	
≥85	13(5.7)	43.0 (20–66)	
Education			**<0.001**
Primary school and less	157(57.3)	52.0 (20–69)	
Secondary school and high school	49(17.9)	59.0 (27–71)	
University and over	24(8.8)	65.0 (49–71)	
Working status			**<0.001**
Retired	132(48.2)	58.0 (27–71)	
Housewife	90(32.8)	51.0 (20–69)	
Working	4(1.5)	55.5 (44–57)	
Unemployed	4(1.5)	46.0 (41–53)	
Perceived level of income			**<0.001**
Income<expenditure	62(22.6)	49.0 (20–67)	
Income =expenditure	161(58.8)	57.0 (27–71)	
Income>expenditure	7(2.6)	55.0 (41–65)	
Marital status			**<0.001**
Married	164(59.9)	56.0 (31–71)	
Single	66(24.1)	48.0 (20–68)	
Living arrangements			**0.011**
Live alone	46(16.8)	50.0 (20–68)	
With spouse	117(42.7)	57.0 (31–71)	
With spouse and children	38(13.9)	53.0 (31–68)	
Other	29(10.6)	50.0 (27–69)	
Chronic disease			**0.115**
Yes	167(60.9)	54.0 (20–71)	
No	63(23.0)	56.0 (22–71)	
Types of chronic diseases[a]			
Diabetes	74(27)		
Hypertension	109(39.8)		
Coronary artery disease	22(8)		
Asthma	15(5.5)		
COPD	3(1.1)		
Chronic renal failure	5(1.8)		
Cancer	4(1.5)		
Other	7(2.6)		
Housing type			**0.073**
Slum	18(6.6)	50.0 (20–60)	
Apartment house	208(75.6)	54.0 (22–71)	
Other	4(1.5)	58.5 (41–64)	

COPD, Chronic Obstructive Pulmonary Disease; sd, standard deviation.

[a] One elder person has multiple diseases. No analysis was made for this variable with SIS scores.

down on me because of my mental health needs' was revised to *'I have felt some people look down on me because of my age'*. The two items fit into two sub-scales, and they were included in both sub-scales of the original scale. Therefore, these two items were removed from the scale, and 20 items remained in the scale. Three individual items were not removed from the scale because they were retained in the sub-scales. In the process of adapting the other two items to older persons, Secker suggested replacing the phrase 'mental health and mental health services' for two items ('my social life has been mainly related to mental health, or people who use mental health services' and 'I have been involved in a group not just for mental health') with 'services for the older persons who use health services' or removing these items from the scale. It has been deemed suitable for researchers to remove these items from the scale, as individuals who can afford to use institutions providing services for the older persons in Turkey are not reflective of the socioeconomic status of the general population. Secker has also granted approval for this change. Finally, the scale consisted of 18 items.

Translation and adaptation of the scale

This scale was prepared in accordance with the World Health Organization guidelines and an updated guide for translation and adaptation of scales (17, 18). After receiving permission via e-mail from Jenny Secker, who developed the SIS, the scale items were translated independently from English into Turkish by bilingual linguists and authors.

Translation of the scale was controlled by a bilingual linguist team including six specialists to avoid inappropriate expressions and inconsistencies. The scale was independently translated again from Turkish into English by two other bilingual linguists. The conceptual and linguistic appropriateness between the original scale and back-translated English version was checked by three different experts.

The content validity of the preliminary SIS was investigated by six public health nurse specialists at different universities in Turkey. Based on their findings, small corrections were made to 18 items for cultural and language differences to comply with Turkish language phraseology (Appendix 1).

Statistical analysis

In the planned methodological study, firstly, the original structure of the scale was tested with confirmatory factor analysis. However, exploratory factor analysis was performed because fit indices in the confirmatory factor analysis were not suitable. Finally, confirmatory factor analysis was performed to test exploratory factor analysis for psychometric evaluations. Cronbach's alpha was used to test the reliability of the scale. All data analyses were performed using the Statistical Package for the Social Sciences version 21.0 for Windows (SPSS Inc. Chicago) and Linear Structural Relationships (Lisrel v8.5, Scientific Software International Inc. Lincoln). The sociodemographic variables associated with SIS score were examined using the Mann–Whitney U test and Kruskal–Wallis test.

The extent of agreement between the specialists was assessed using a content validity index (CVI). The specialists evaluated the feasibility and appropriateness of each item on the scale by rating them as follows: 1=not relevant, 2=unable to assess relevance without item revision or the item requires a level of revision that would render it irrelevant, 3=relevant but needs minor alteration and 4=very relevant.

Corrected total item correlations, Cronbach's alpha and alpha item-total correlations were included in the analysis to determine the internal consistency. Split-half method using Spearman Brown formula was used for reliability. A reliability coefficient of 0.70 or greater is considered as an evidence for internal consistency of new instruments, along with Cronbach's alpha value range from 0.00 to 1.00, wherein higher values indicate greater reliability (19).

We examined the relationship between social inclusion and the loneliness level as the criterion.

Pearson correlation analysis of the scale with the LSE was conducted to establish criterion validity.

Principal component analysis and varimax rotation with Kaiser Normalisationto test the construct validity were used for exploratory factor analysis. Before conducting the factor analysis, the Kaiser–Meyer–Olkin (KMO) measurement and Bartlett test were performed to determine the adequacy of the sample size. Kaiser–Meyer–Olkin values exceeding 0.5 indicate sufficient sample sizes for factor analysis (20). All factors with eigenvalues of at least 1.0 were retained. A first-order confirmatory factor analysis of data from the SIS (Tr) was conducted.

Confirmatory factor analysis is a specific structural equation modelling technique used to identify the goodness-of-fit index (GFI). The goodness of the calculated fit indices includes Pearson's $\chi 2$ statistic with the freedom scores, the Bentler & Bonett's comparative fit index (CFI), the GFI, the root mean error of approximation (RMSEA), adjusted goodness-of-fit index (AGFI) and the Bentler & Bonett's non-normed fit index (NNFI). Model fitness is indicated by an RMSEA less than 0.08,GFI, CFI and NNFI values greater than 0.9 and an AGFI greater than 0.8 (21).The weighted least squares method was chosen in the Lisrel program because SIS consisted of categorical variables.

Signed informed consent was obtained from all older persons aged ≥65 years. The ethics committee of university approved the study (21 February 2016-number:162), which was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

CVI was found to be 0.97 for all items of SIS. This study included 230 older persons aged ≥65 years (127 females and 103 males; mean age=72.5 ±6.7 years). Demographic characteristics of the participants are shown in Table 1. The mean SIS and LSE scores were 52.73±11.24 and 8.14±5.90, respectively.

The sociodemographic characteristics of individuals influenced their social inclusion. A high socioeconomic status (Konyaalti), sex (male), age (65–74 years), a high education level (university and over), working status (retired and working), perceived income status (income=expenditure and income > expenditure), marital status (married),living arrangements (with spouse and children) and dependency status (independent) positively affected social inclusion ($p<0.05$). Conversely, the presence of chronic disease and housing type did not influence social inclusion ($p>0.05$) (Table 1).

Cronbach alpha internal consistency and split-half reliability coefficient of SIS was 0.894 and 0.825, respectively. The Cronbach alpha values of the factor 1, 2 and 3 were 0.877, 0.828 and 0.472, respectively. All corrected item-total correlations exceeded the accepted cut-off of 0.32 (Table 2) (21). A correlation analysis revealed a negative correlation between the SIS and LSE ($r=-0.716$, $p<0.001$). There was a negative correlation between the emotional loneliness of LSE and the sub-scales of factor 1, factor 2 and factor 3 of SIS ($r=-0.517$, -0.391 and -0.320, respectively; $p<0.001$). A negative correlation was also found between the social loneliness of LSE and SIS sub-scales ($r=-0.687$, -0.509 and -0.216, respectively; $p< 0.001$).

The results of the confirmatory factor analysis for testing the original structure were as follows: GFI was 0.828 ($X^2=357.87$, $p<0.01$), CFI was 0.935 and RMSEA was 0.118.

Before the exploratory factor analysis, the KMO value was computed. The KMO score was 0.90, and Bartlett's test of sphericity reached significance ($p<0.001$), indicating that the sample was sufficiently large and adequate factorability of the correlation matrix was achieved to perform a satisfactory factor analysis.

Table 3 presents the item–factor loadings for the Turkish version of the SIS when the data from all 230 older persons aged ≥65 years were analysed. The 18 items of the SIS were analysed using a varimax

Table 2. Item analysis of the SIS (n=230).

		Mean (sd)	Corrected item-total correlation	Cronbach's Alpha if Item Deleted
S1	I have felt terribly lonely and isolated.	3.22 (1.03)	0.554	0.888
S2	I have felt accepted by my friends.	3.41 (0.86)	0.671	0.885
S3	I have been out socially with friends.	2.64 (1.17)	0.667	0.884
S4	I have felt that I play a useful part in society.	2.86 (1.12)	0.687	0.883
S5	I have friends I see or talk to every week.	2.94 (1.18)	0.702	0.883
S6	I have felt what I do is valued by others.	3.16 (1.03)	0.707	0.883
S7	I have been to new places.	2.34 (1.11)	0.627	0.886
S8	I have learnt something about other cultures.	2.18 (1.16)	0.625	0.886
S9	I have done some cultural activity (for example gone to a library, museum, gallery, theatre, concert).	1.93 (1.01)	0.511	0.889
S10	I have felt some people look down on me because of my age.	3.36 (0.98)	0.387	0.893
S11	I have felt unsafe to walk alone in my neighbourhood in daylight.	3.05 (1.20)	0.330	0.898
S12	I have felt accepted by neighbours.	3.56 (0.82)	0.529	0.889
S13	I have felt accepted by my family.	3.76 (0.56)	0.490	0.891
S14	I have felt clear about my rights.	3.22 (0.99)	0.649	0.885
S15	I have felt free to express my beliefs.	3.43 (0.94)	0.528	0.889
S16	I have felt insecure about where I live.	3.38 (1.01)	0.332	0.900
S17	I have done a sport, game or physical activity.	1.99 (1.13)	0.496	0.890
S18	I have helped out at a charity or those in need of help around me.	2.21 (1.20)	0.457	0.892

SIS=Social Inclusion Scale, SD=Standard Deviation

rotation. In this study, three factors with eigenvalues exceeding 1.00 were detected. At the end of varimax rotation, the factors clarified 55.14% of the variance. Factor loadings were significant with standardised loading ranging 0.437–0.829 (Table 3). According to the explanatory factor analysis, factor 1 consists of items 1, 2, 3, 5, 6, 10, 12, 13, 14 and 15; factor 2 consists of items 4, 7, 8, 9, 17 and 18 and factor 3 consists of items 11 and 16. Confirmatory factor analysis was followed by exploratory factor analysis.

As a result of confirmatory factor analysis, the model fit indices met the acceptability criteria (Figure 1).The GFI was 0.983 (X^2=379.862, p<0.01), the CFI was 0.986 and the RMSEA was 0.090 (Table 4).

DISCUSSION

Mental health problems are increasingly observed in older persons. Social inclusion may be useful for protecting mental health and guiding community-based health activities. For these reasons, the level of social inclusion must be determined to preserve and improve the mental health of older persons aged ≥65 years. Therefore, this new scale could be extremely useful as a sensitive and simple questionnaire for assessing social inclusion among older persons. The results of this study revealed the cross-cultural validation and psychometric properties of SIS, which is a rare instrument that measures social inclusion in older persons. Having a good level of income and education and being younger (aged 65-74), married and independent in daily living activities provided better social inclusion. This finding can be considered as an indicator of the selectivity of SIS.

Table 3. Factor loading values of the Turkish version of the Social Inclusion Scale [a] (n=230).

Item No	Factor 1	Factor 2	Factor 3
S12	0.777		
S13	0.735		
S2	0.703		
S6	0.663		
S5	0.618		
S3	0.595		
S10	0.593		
S1	0.576		
S14	0.496		
S15	0.437		
S8		0.829	
S9		0.813	
S7		0.782	
S4		0.578	
S17		0.555	
S18		0.546	
S16			0.785
S11			0.782
% Explained variance	**38.52**	**9.62**	**7.00**

[a]Exploratory factor analysis

Table 4. . Goodness-of-fit Indices for the SIS [a] (n=230).

Index	Original version	Turkish version
Goodness-of-fit index (GFI)	0.828	0.983
GFI adjusted for degrees of freedom (AGFI)	0.757	0.978
X^2-test	357.87	379.862
X^2- test DF	85	132
Pr> X^2	<0.01	<0.001
Root mean square error of approximation (RMSEA)	0.118	0.090
RMSEA 90% lower confidence limit	106	193
RMSEA 90% upper confidence limit	131	310
Bentler's comparative fit index	0.935	0.986
Bentler & Bonett's (1980) non-normed fit index	0.920	0.984
Bentler & Bonett's (1980) normed fit index	0.916	0.979

[a]Confirmatory factor analysis, SIS=Social Inclusion Scale

In this study, content validity was investigated using the CVI of six specialists. The value was 0.97 for SIS, which was in line with the suggested excellent content validity (14). The calculated KMO was 0.90, and the Bartlett's test sphericity value was 1807.77 (df=153, p<.001), indicating that the sample size was sufficient to perform a satisfactory factor analysis.

SIS exhibited adequate internal consistency which is an acceptable value for a scale (0.70) (22). The internal consistency was similar to that of the original version (Cronbach's alpha=0.85). In another study, Cronbach's alpha was 0.80 (6). All items of the SIS displayed appropriate corrected item-total correlations (0.33–0.70) (23). But the weakness of the internal consistency of the third factor may be due to the fact that it has only two items.

According to the correlation analysis, social inclusion is inversely associated with loneliness, as indicated by the negative high correlation between the SIS and LSE. This result confirms the criterion validity hypothesised in this study. In another study, the SIS was significantly and positively correlated with the Warwick-Edinburgh Mental Wellbeing Scale (r=0.674) (6). According to these results, loneliness should be reduced and well-being should be improved to increase social inclusion.

According to the results of the confirmatory factor analysis testing the original structure of the scale, model conformity indices did not meet the acceptability criteria. To assess the construct validity of the scale exploratory factor analysis was performed followed by confirmatory factor analysis. Exploratory factor analysis of the SIS was conducted using the principle component method with varimax rotation. All items in the SIS were clustered into three sub-scales, and they met the factor loading of items criterion of at least 0.30 (14). According to the

factor analysis, the factors explained 55.14% of the variance. It is sufficient that multi-factorial structures explain 40%–60% of the variance (21).

Confirmatory factor analysis demonstrated that the factor structure was broadly appropriate. The model fit indices exceeded the acceptable level excluding the RMSEA, the value of which was extremely close to the cut-off. This value was possibly lower than the acceptable criterion because the sample size was insufficient. According to Tabachnick and Fidell, the sample should consist of at least 300 individuals. Increasing the sample size is expected to increase the power of the analysis (24). Comrey and Lee described sample sizes of 100, 200, 300, 500 and 1000 or more as poor, fair, good, very good and excellent, respectively (25). It is predicted that the RMSEA will reach the cut-off in future studies with larger sample sizes.

The results of this study provide evidence that the SIS is a valid instrument for determining the social inclusion status of older persons aged ≥65 years. This study confirmed that the Turkish version of the SIS was reliable for use in older persons aged ≥65 years. In summary, this study validates the SIS and supports its use as a practical, brief and simple instrument in Turkish populations. The Turkish version of the SIS exhibited good reliability and validity at statistically acceptable levels. However, the generalizability of the results of this study may be limited because the data were collected from a single city in Turkey. The RMSEA in confirmatory factor analysis approached the acceptable level. Test–retest reliability could not be assessed. Future studies should perform test–retest reliability

Figure 1. Factor loadings for the Social Inclusion Scale.

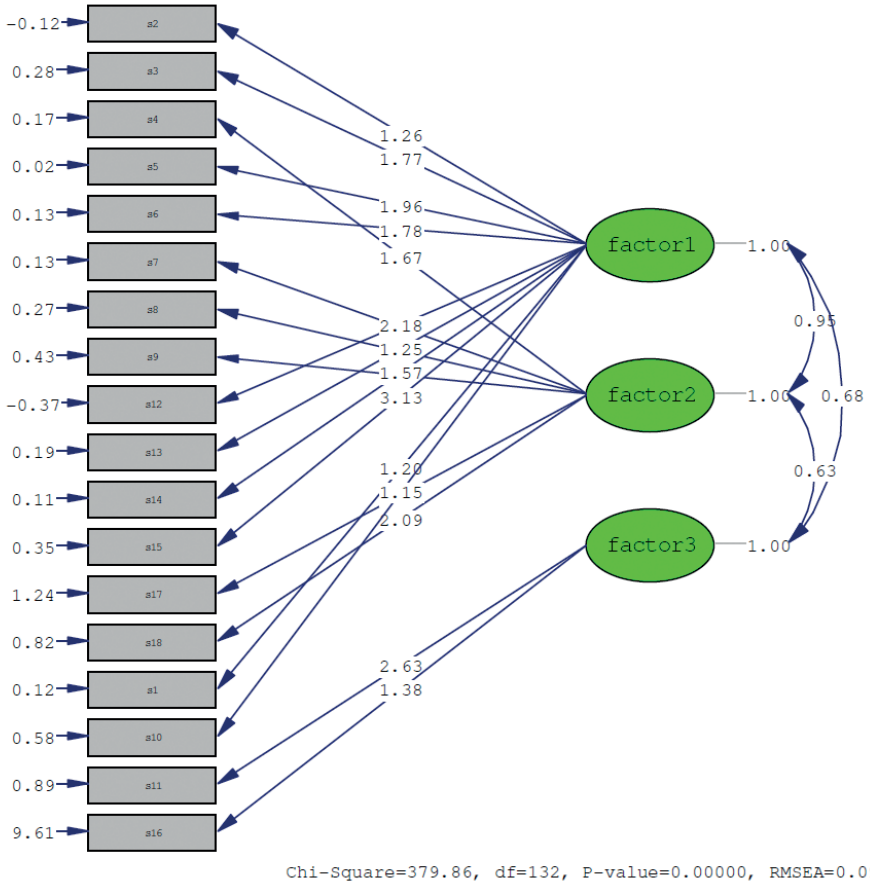

Table 5. Item analysis of the SIS (n=230).

	1= Not at all, 2= Not particularly, 3= Yes a bit, 4= Yes definitely 1= Hiç, 2= PekDeğil, 3= Biraz, 4= Evet Kesinlikle	**1**	**2**	**3**	**4**
1	I have felt terribly lonely and isolated. *Son derece yalnız ve dışlanmış hissediyorum.*	4	3	2	1
2	I have felt accepted by my friends. *Arkadaşlarım tarafından kabulgördüğümü hissediyorum*	1	2	3	4
3	I have been out socially with friends. *Arkadaşlarımla dışarıda vakit geçiriyorum*	1	2	3	4
4	I have felt that I play a useful part in society. *Toplum dayararlı bir rol oynadığımı hissediyorum.*	1	2	3	4
5	I have friends I see or talk to every week. *Her hafta görüştüğüm ve konuştuğum arkadaşlarım var.*	1	2	3	4
6	I have felt what I do is valued by others. *Yaptıklarıma başkaları tarafından değer verildiğini hissediyorum.*	1	2	3	4
7	I have been to new places. *Yeni yerlerde bulunuyorum.*	1	2	3	4
8	I have learnt something about other cultures. *Başka kültürler hakkında birşeyler öğreniyorum.*	1	2	3	4
9	I have done some cultural activity (for example gone to a library, museum, gallery, theatre, concert). *Bazı kültürel aktivitelerde (örneğin kütüphane, müze, galeri, tiyatro ve konsere gitmek) bulunuyorum.*	1	2	3	4
10	I have felt some people look down on me because of my age. *Yaşım nedeniyle bazı insanların beni küçümsediğini hissediyorum.*	4	3	2	1
11	I have felt unsafe to walk alone in my neighbourhood in daylight. *Yaşadığım mahallede gündüz tek başına dolaşırken kendimi güvende hissetmiyorum.*	4	3	2	1
12	I have felt accepted by neighbours. *Komşularım tarafından Kabul gördüğümü hissediyorum.*	1	2	3	4
13	I have felt accepted by my family. *Ailem tarafından Kabul gördüğümü hissediyorum*	1	2	3	4
14	I have felt clear about my rights. *Haklarımı net bir şekilde biliyorum.*	1	2	3	4
15	I have felt free to express my beliefs. *İnançlarımı ifade etmekte kendimi özgür hissediyorum.*	1	2	3	4
16	I have felt insecure about where I live. *Yaşadığım yerde kendimi güvende hissetmiyorum.*	4	3	2	1
17	I have done a sport, game or physical activity. *Bir spor, maç ya da fiziksel aktivite yapıyorum.*	1	2	3	4
18	I have helped out at a charity or those in need of help around me. *Bir yardım kuruluşuna veya yakınımda ihtiyacı olanlara yardımda bulunuyorum.*	1	2	3	4

analyses and utilise larger sample sizes from various populations.

Valid and reliable measurement tools are needed to determine the social inclusion status of older persons in disadvantaged groups in terms of psychological problems. We have developed a reliable and valid scale for assessing the social inclusion level. The SIS is a simple, short and easy measurement tool for examining social isolation, interpersonal relations and social acceptance among individuals. Its use is recommended in all areas. Researchers, community leaders and mental health providers can use the SIS to assess the social inclusion levels of older persons. After implementing the SIS, individuals with low social inclusion levels should be identified early, and necessary precautions should be taken to improve their social inclusion.

Limitations

There are certain limitations to our study. The fact that individuals under the age of 65 years could not be included in the study is considered to be a limitation. Further, very elderly group could not be evaluated in sufficient numbers because they experienced difficulty in reaching FHC. In this study, the fact that the factor structure of the original SIS was not confirmed can be considered as a limitation. However, explanatory factor analysis supported three sub-dimensional structures, and these structures were supported by confirmatory factor analysis. It is recommended that researchers who want to use the adapted SIS should evaluate the total score.

Conflict of interest

The authors stated that there is no potential conflict of interest in relation to the research.

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Serbay ŞEKERÖZ[1]
Emine ASLAN TELCİ[1]
Nuray AKKAYA[2]

RESEARCH

EFFECT OF CHRONIC NECK PAIN ON BALANCE, CERVICAL PROPRIOCEPTION, HEAD POSTURE, AND DEEP NECK FLEXOR MUSCLE ENDURANCE IN THE ELDERLY

Abstract

Introduction: The purpose of this study was to investigate the effect of chronic nonspecific neck pain on balance, cervical proprioception, head posture, and deep neck flexor muscle endurance in the elderly.

Materials and Method: Elderly participants aged ≥65 years with chronic neck pain (n=16; 9 females) and without neck pain [n=16; 8 females (control group)] were included in this study. Balance function of the participants was assessed using the SportKAT 550 kinesthetic balance device, one-leg standing test, and timed up and go test. The joint position error test was used to evaluate cervical proprioception. Head posture was assessed by craniovertebral angle measurement, and muscle endurance was evaluated by the deep neck flexor endurance test.

Results: All balance tests results, joint position error value, and deep neck flexor muscle endurance were better in the control group than in the neck pain group ($p<0.05$). No difference was observed between the neck pain and control groups with respect to the craniovertebral angle value ($p>0.05$).

Conclusion: Our results indicate that chronic neck pain negatively affects the balance, cervical proprioception, and muscle endurance in the elderly. Our study results will guide health professionals to plan appropriate treatment strategies for the elderly with neck pain.

Keywords: Aged; Neck pain; Postural balance; Proprioception; Posture.

CORRESPONDANCE
Serbay ŞEKERÖZ
Pamukkale University, School of Physical Therapy and Rehabilitation, Denizli, Turkey.

Phone: +902582964298
e-mail: serbaysekeroz@gmail.com

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[1] Pamukkale University, School of Physical Therapy and Rehabilitation, Denizli, Turkey.
[2] Pamukkale University, Faculty of Medicine, Department of Physical Medicine and Rehabilitation, Denizli, Turkey.

ARAŞTIRMA

YAŞLILARDA KRONİK BOYUN AĞRISININ DENGE, SERVİKAL PROPRİOSEPSİYON, BAŞ POSTÜRÜ VE DERİN BOYUN FLEKSÖR KAS ENDURANSI ÜZERİNE ETKİSİ

Öz

Giriş: Bu çalışmanın amacı, yaşlı popülasyonda kronik nonspesifik boyun ağrısının denge, servikal propriosepsiyon, baş postürü ve derin boyun fleksör kas enduransı üzerine etkisini incelemektir.

Gereç ve Yöntem: Çalışmaya 65 yaş ve üzeri kronik boyun ağrılı (n=16; 9 kadın) ve boyun ağrısı olmayan [n=16; 8 kadın (kontrol grubu)] yaşlı bireyler dahil edildi. Katılımcıların denge fonksiyonu SportKAT 550 kinestetik denge cihazı, tek ayak üzerinde durma testi ve zamanlı kalk yürü testi kullanılarak değerlendirildi. Servikal propriosepsiyonu değerlendirmek için "eklem pozisyon hata testi" kullanıldı. Baş postürü kraniovertebral açı ölçümü ve kas enduransı "derin boyun fleksör endurans testi" ile değerlendirildi.

Bulgular: Kontrol grubunda tüm denge test sonuçları, eklem pozisyon hata değeri ve derin fleksör kas enduransı boyun ağrılı gruba göre daha iyiydi ($p<0.05$). Kraniovertebral açı değeri açısından iki grup arasında anlamlı bir fark yoktu ($p>0.05$).

Sonuç: Çalışma sonuçları kronik boyun ağrısının yaşlılarda denge, servikal propriosepsiyon ve kas enduransını olumsuz yönde etkilediğini işaret etmektedir. Sonuçlar; boyun ağrılı yaşlılarda uygun tedavi stratejilerini belirlemek için sağlık profesyonellerine yol gösterici olacaktır.

Anahtar sözcükler: Yaşlı; Boyun ağrısı; Postüral denge; Propriosepsiyon; Postür

INTRODUCTION

Neck pain is a common health problem that negatively affects the quality of life of individuals of different age groups, and most people experience this problem at some point in their lives. Neck pain significantly affects the family, community, healthcare costs, and business life and has become an increasingly widespread health problem (1). In a study conducted by Hoy et al., it is reported that the prevalence of neck pain in the general population varies from 0.4% to 86.8% and the 12-month prevalence ranges from 12.1% to 71.5% (2). It is a common problem in the elderly and in the general population. The point prevalence of neck pain in the elderly was reported to be 38.7% (3).

Receptors in the cervical region are connected to the visual and vestibular system as well as the central nervous system. Afferent input from these receptors may be impaired owing to trauma, dysfunction of the receptors, muscle tissue sensitivity, and pain, which may result in impaired balance (postural instability), decrease in proprioception, and impaired head and eye movements. It is important to understand the contribution of neck pain to sensorimotor functions in the elderly because postural instability increases the risk of falls (4).

Increasing age is accompanied by changes in vestibular, visual, and neuromuscular functions, which are considered normal. It has been shown that cervical proprioception and postural stability are impaired in healthy elderly individuals but not in healthy adults (5). Neck pain in young adults has been associated with increased cervical joint position error (JPE), poor eye movement control, and balance disorders (6). Examination of the disorders documented in young population for the elderly with neck pain and investigation of its effect on sensorimotor functions may be useful.

In a study conducted by Szeto et al. on female office staff, it was reported that there was an increase in cervical postural errors in patients with neck pain compared with asymptomatic patients (7). No previously published studies have found a relationship between chronic neck pain and anterior head posture in the elderly.

Pain causes errors in the activation of the muscles by providing abnormal afferent input. Furthermore, it causes delay in cortical responses (8), resulting in protective spasm in the muscles and decreased circulation in the muscles after the spasm. The muscle with decreased blood flow commences anaerobic metabolism, leading to decreased muscle endurance (9). The relationship between neck pain and flexor muscle endurance in young and middle-aged groups has been investigated (10,11). Studies examining the effect of neck pain on deep neck flexor (DNF) endurance in the elderly will contribute to the literature.

This study aimed to investigate the effect of chronic nonspecific neck pain on the balance, cervical proprioception, head posture, and DNF endurance in the elderly.

MATERIALS AND METHOD

Participants

The study included 32 elderly volunteers aged ≥65 years, including those with complaints of ongoing nonspecific neck pain for at least 3 months (neck pain group, n=16) and those with no complaints (control group, n=16).

The inclusion criteria for the neck pain group were as follows:

- having a pain intensity of ≥3.5 cm according to the Visual Analogue Scale (VAS)
- having a score at least 5 out of 50 on the Neck Disability Index (NDI)
- no cognitive problems according to the Hodkinson Abbreviated Mental Test (HAMT)
- not having musculoskeletal pain except neck pain

The control group included individuals without cognitive problems and complaints of neck pain in

the last year. Participants with no musculoskeletal pain in any part of the body during the evaluation were included in the control group.

To eliminate other factors that may affect the results, participants who satisfied the following criteria were excluded in both groups: taking more than four medications or medication which could affect balance, a history of spinal surgery, orthopedic surgery in the last year, neurological or vestibular pathology, malignant conditions, psychological disorders, and visual disturbances despite glasses.

The neck pain group selected from patients who applied to physical therapy and rehabilitation outpatient clinic. The control group was selected from the subjects accompanying with patients who applied to physical therapy and rehabilitation outpatient clinic with other problems. All participants were included in the study after being evaluated according to inclusion criteria by a psychiatrist.

A very large effect size was found in the reference study used in power analysis (d=1.7) (12). Assuming we can achieve a lower effect size level (d=1.1), a power analysis was performed before the study. On the basis of the results of power analysis, it was calculated that 90% power would be obtained with 95% confidence when 32 elderly participants (16 patients and 16 controls) were included in the study. For total balance results of SportKAT 550 kinesthetic balance device, we had a very large effect size (d=1.14) and with this result we reached 93.5% power with 95% confidence. Moreover, for JPE results, we had a very large effect size (d=1.34) and with this result we reached 98% power with 95% confidence.

The study was approved by Pamukkale University Medical Ethics Committee with the number 60116787-020/49874 on 03/08/2017. The study was conducted in accordance with the Declaration of Helsinki. All individuals included in the study signed the informed consent form.

Questionnaires

The questionnaire was used to determine demographic data, pain intensity, neck disability level, cognitive status, and musculoskeletal pain localization. On the basis of the VAS scores, Boonstra et al. classified the pain experienced by patients with chronic musculoskeletal pain as mild (≤3.4cm), moderate (3.5–7.4 cm), and severe (≥7.5 cm) (13). Participants with moderate and severe pain intensity were included in this study.

Balance assessment

Static (one-leg standing test and SportKAT 550 kinesthetic balance device) and dynamic balance (timed up and go test) assessments was performed.

The one-leg standing test (OLST) is appropriate and valid for the assessment of the elderly. Participants were allowed to practice before the test and were asked to decide which leg to lift during the test period. Participants were asked to lift the leg they had chosen while standing up to their arms in a drooping position. The test was terminated when the support leg was repositioned, the raised leg contacted the floor, the support of the observer was obtained, or the maximum test time of 30 seconds was completed. Three trials were performed in the eyes open and closed position, and the best results in these positions were recorded (14).

The SportKAT 550 kinesthetic balance device provides objective data for balance assessment. The device comprises the following two parts: an electronic tilt sensor and a movable platform. The electronic sensor evaluates the movement of the platform throughout the test period and transmits the data to the connected computer. The cross on the monitor screen represents the center of the platform; during the test period, the participant is asked to keep this mark in the center. The difficulty of test is adjusted by changing the pressure of the movable platform. Increasing the pressure increases the stability of the platform and makes the test easier. The evaluations were performed at 10 PSI stability value. At the end of the 30 second

test period, the device calculates a balance score between 0 and 6000. Low scores obtained from the test indicate that the balance performance is good (15).

The timed up and go test (TUGT) was used to evaluate the dynamic balance. This is a reliable and valid test recommended for evaluation of dynamic balance in geriatric population. The participant was asked to stand up from the chair without any support, walk to the target at a distance of 3 meters, return around the target without touching any place, and sit on the chair again; the evaluator noted the time of completion of the test. Three trials were performed, and the best result was recorded (16).

Cervical proprioception assessment

The JPE test defined by Revel et al. was used to evaluate cervical proprioception (17). In this test, a small laser pointer mounted in a light helmet and a panel of circles drawn 1 cm apart were used as target. The participants were seated in a back-supported chair, 90 cm from the wall-mounted panel. Participants were asked to memorize the first neutral position and try to find the same point after an active head movement. Active head movements included flexion, extension, and right and left rotations. Each movement was repeated 10 times. Later, horizontal, vertical, and global distances to the starting point of the each returned point after movement were recorded. The mean value of all errors (distances) in centimeter was used for analysis.

Forward head posture assessment

Anterior head posture was evaluated using the craniovertebral angle (CVA) value. CVA was determined by measuring the angle between the horizontal line and the line connecting the tragus of the ear to the C7 spinous process. A digital camera was placed at a distance of 1.5 meters on a fixed base, and the height of the camera was adjusted to the shoulder level. To provide the correct posture, individuals were asked to stand in a comfortable posture and look at a point straight in front of them, and a marker was sticked on the C7 spinous process. Using the computer program, CVA values were obtained from the photograph taken. Reduction of the CVA value indicates increased forward head posture (18).

Deep neck flexor endurance assessment

The DNF endurance test described by Olson et al. was used (19). The test was performed in a supine, hook-lying position. The participants' hands were placed on the abdomen. The subjects were asked to pull their chin in maximally tucked and lift their head off the bed (approximately 2.5 cm from the resting position). They were requested to maintain this position for as long as possible without distortion, and the time for which the position was maintained was recorded in seconds. The test was terminated when the chin-tuck position disappeared, sudden and severe pain occurred, and the subjects did not want to continue the test. For appropriate application, the test was applied to the subjects in a practical way before evaluation. The trial period was kept as short as possible to avoid pain and fatigue.

Statistical analysis

SPSS package program was used for data entry and analysis process. Conformity of data to normal distribution was examined with Shapiro–Wilk test. Descriptive statistics were given as mean±standard deviation and median (minimum–maximum) and the categorical variables as number and percentage. In the comparisons between study groups, when the parametric test assumptions were provided, independent samples t-test was used for independent variables and Mann–Whitney U test was used when parametric test assumptions were not provided. Chi-square analysis was used when categorical variables were compared between groups. The statistical significance level was determined as 0.05.

RESULTS

The descriptive data of groups are presented in Table 1. Participants in both groups had similar descriptive data. In addition, the results of VAS, HAMT, and NDI used to determine the adequacy to inclusion criteria are presented in Table 1.

Table 2 presents the results of the static and dynamic balance tests. The neck pain group exhibited significantly worse balance results in the anterior (p=0.029) and total balance (p=0.003) scores of SportKAT 550 kinesthetic balance device. Right, left, and posterior balance scores of SportKAT 550 kinesthetic balance device were higher in the neck pain group; however, this difference was not statistically significant. The results of the eyes open (p=0.049) and eyes closed (p=0.001) in OLST were statistically worse in the neck pain group. The neck pain group took significantly longer to complete TUGT than the control group (p=0.005).

JPE, CVA, and DNF endurance values of the groups are presented in Table 3. When the JPE values indicative of cervical proprioception were examined, it was found that all the error values in the neck pain group were higher and the vertical (p=0.002) and global (p=0.001) error values were statistically higher than in the control group. CVA values in the neck pain group were lower than in the control group, but the difference was not statistically significant (p=0.061). DNF endurance values were found to be statistically lower in the neck pain group than in the control group (p=0.004).

Table 1. Characteristics of the neck pain and control groups.

Variable	Neck Pain Group (n=16) mean±sd	Control Group (n=16) mean±sd	p
Age (yrs)	68.8±4.3	68.7±3.7	0.985
Height (cm)	163.1±8.9	162.8±7.9	0.956
Weight (kg)	73.6±12.2	76.9±9.4	0.396
BMI (kg/m^2)	27.7±4.3	29.1±3.8	0.321
Education (yrs)	8.3±4.3	7.8±3.7	0.669
VAS (0–10 cm)	5.1±1.8	-	
HAMT (0–10 score)	9.4±0.7	9.4±0.7	
NDI (0–50 score)	12.8±3.5	-	
Gender (female) n(%)	9 (56.2)	8 (50)	0.723
Daily medication			
No medication n(%)	4 (25.0)	1 (6.3)	0.664
1	2 (12.5)	2 (12.5)	
2	3 (18.8)	5 (31.3)	
3	5 (31.3)	6 (37.5)	
4	2 (12.5)	2 (12.5)	

Table 2. The comparison of the results of balance tests of neck pain and control groups.

Variable	Neck Pain Group (n=16) mean±sd median (min–max)	Control Group (n=16) mean±sd median (min–max)	p
SportKAT 550			
Right balance score	387.3±263.8 291.5 (142–1099)	273.3±153.9 243.5 (84–765)	0.171[a]
Left balance score	349.8±191.6 368.5 (7–759)	227.6±162.9 191.5 (10–572)	0.06[b]
Anterior balance score	388.2±320.2 345.5 (3–1065)	190.6±92.3 185.0 (52–353)	**0.029[b]**
Posterior balance score	348.9±313.1 215 (17–965)	310.1±218.3 227.0 (62–720)	0.956[a]
Total balance score	737.1±242.9 738.5 (319–1193)	500.9±161.8 456.0 (291–775)	**0.003[b]**
OLST (sec.)			
Eyes open	14.5±8.8 11.8 (5.1–30)	20.6±8.0 22.4 (6.9–30)	**0.049[a]**
Eyes closed	2.9±2.3 2.5 (0.9–8.7)	7.1±5.5 5.2 (1.7–24.7)	**0.001[a]**
TUGT (sec.)	11.6±2.1 11.4 (8.5–16.1)	9.9±0.9 9.7 (9.0–12.3)	**0.005[a]**

[a]Mann–Whitney U test;[b], independent samples t-test; statistically significant results are given in bold

DISCUSSION

Neck pain is a common problem that negatively affects the quality of life, functionality, and well-being of a person (2). This study aimed to determine the effect of chronic neck pain on balance, cervical proprioception, head posture, and DNF muscle endurance in the elderly population. The results of the study indicated that elderly with chronic neck pain showed greater deficits in balance, cervical proprioception, and deep neck flexor muscle endurance than those in the control group.

Previously, balance performance has been shown to be worse in people with neck pain compared with healthy individuals (4,6,12,20). However, these studies were conducted with patients of different age groups (6,20) and those with neck pain with other comorbidities (12). In line with our findings, Poole et al. reported that the dynamic and static balance performances of the patients with nonspecific neck pain were worse compared with those of participants in the control group. Additionally, the researchers found that the anteroposterior balance was negatively affected in the neck pain group compared with the control group (4). In another study, it was stated that the anteroposterior balance disorders are mostly of somatosensorial origin and mediolateral balance disorders are more of the vestibular problem origin (6). Similarly, our results showed that the

Table 3. The comparison of JPE, CVA, and DNF endurance values of neck pain and control groups.

Variable	Neck Pain Group (n=16) mean±sd median (min–max)	Control Group (n=16) mean±sd median (min–max)	p
JPE (cm)			
Horizontal error	5.3±2.8 5.1 (1.8–10.1)	4.2±1.6 4.2 (1.7–7.4)	0.197[b]
Vertical error	6.9±3.1 5.7 (3.0–14.7)	3.74±1.73 4.06 (1.25–6.38)	**0.002**[b]
Global error	9.6±3.2 9.0 (5.1–16.8)	6.32±1.32 6.63 (3.88–8.40)	**0.001**[b]
CVA (°)	43.8±5.3 42.7 (35.5–51.9)	46.7±2.5 46.5 (42.2–52.9)	0.061[b]
DNF endurance (sec.)	25.2±6.8 27.3 (9.5–34.2)	33.5±7.7 33.6 (22.7–52.6)	**0.004**[a]

[a]Mann–Whitney U test;[b], independent samples t-test; statistically significant results are given in bold

anterior balance was worse in the neck pain group compared with that in the control group. In the literature review, the effects of neck pain on balance in individuals of different age groups are examined. However, the number of studies conducted on elderly patients with chronic neck pain is less than those conducted on patients of other age groups (12). This study will contribute to the literature in this respect. Additionally, this study suggests that balance problems should be considered more in the elderly with chronic nonspecific neck pain.

As with the central nervous system, receptors in the cervical region have important connections with the vestibular and visual system. The pain-related disturbances in these receptors can cause afferent changes that would disrupt sensorimotor control. In our study, the JPE values used to evaluate proprioception were significantly higher in the neck pain group than in the control group Even though studies conducted on individuals of different age groups showed that JPE values were significantly higher in patients with neck pain, some studies reported that this difference was not statistically significant (17,21,22). We have reached only one study investigated the effect of chronic neck pain on cervical proprioception in the elderly population. In this study, although the cervical joint error values in the neck pain group were higher than those in the control group, the difference was not significant (12). The literature has not reached sufficient saturation. Further studies are needed on the subject.

Data from our study showed that elderly with chronic neck pain exhibited more forward head posture than those in the control group. However, this difference was not significant. On the contrary, Yip et al. reported a significantly increased forward head posture in patients with neck pain (23). Studies investigating the relationship between neck pain and forward head posture indicated a moderate correlation (18,24). However, no study selected the elderly as the study population. We did not examine other factors that may affect the head posture, such as body types, previous work, and

occupations of participants. There are few studies examining the relationship between neck pain and anterior head posture, and different results of these studies. Further studies are warranted to examine the effect of neck pain on head posture.

Pain leads to incorrect afferent information, delayed cortical responses, muscle spasm, and decreased blood flow. Muscles with decreased blood flow commence anaerobic metabolism, resulting in decreased muscle endurance. Numerous studies show decreased endurance of the flexor muscle in patients with neck pain, but no studies have been conducted on the elderly population (10,25). Results of our study show that the DNF muscle endurance in the neck pain group decreased significantly compared with that in the control group.

In conclusion, chronic nonspecific neck pain negatively affected the balance, cervical proprioception, and deep neck flexor muscle endurance in the elderly. It may be useful adding rehabilitation practices such as proprioceptive training to the treatment programs to improve the balance ability of patients with chronic nonspecific neck pain. Incorporating exercises in the rehabilitation process of DNF muscles with decreased endurance may help these muscles perform their functions better. Evaluating these variables and regulating treatment programs in this direction by health professionals working with the elderly with neck pain could increase the effectiveness of treatment.

Conflict of interest

None.

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■ Cihangir DOĞU[2]
■ Selçuk KAYIR[1]
■ Güvenç DOĞAN[1]
■ Arzu EKİCİ AKDAĞLI[1]
■ Serhat ÖZÇİFTÇİ[1]
■ Özgür YAĞAN[1]

RESEARCH

TRACHEOTOMY AMONG PATIENTS IN GERIATRIC AGE GROUP TREATED IN INTENSIVE CARE UNITS

Abstract

Introduction: In intensive care units, numerous geriatric patients are mechanically ventilated, and those with prolonged mechanical ventilation show high mortality. Such geriatric patients may greatly benefit from tracheotomy because it facilitates pulmonary care, increases patient comfort and helps wean them off mechanical ventilation.

Materials and Method: A total of 70 mechanically ventilated geriatric patients were includ-ed. Patients' electronic data, file records, age, sex, mechanical ventilation requirement, Acute Physiology and Chronic Health Evaluation II score, intubation and intensive care unit stay durations, discharge status and complications were examined.

Results: The mean patient age was 78.6±7.4 years, and the mean Acute Physiology and Chronic Health Evaluation II score was 27.0±5.9. Tracheotomy was performed after a mean duration of 34.8±17 days, and the mean intensive care unit stay duration was 94±54 days. Major and minor haemorrhage were observed in 1 (1.4%) and 3 (4.2%) patients, respectively. Total 53 (76%) patients died, 8 (11%) patients were discharged and 9 (13%) patients are still hospitalized.

Conclusion: The reluctance of geriatric patients' relatives to perform tracheotomy affects the time of procedure and duration of intensive care unit stay.

Keywords: Critical care; Geriatrics; Tracheotomy; Respiration, Artificial

CORRESPONDANCE

Selçuk KAYIR
Hitit University, Erol Olçok Training and Research Hospital, Department of Anesthesiology and Reanimation, Çorum, Turkey

Phone: +903642193000
e-mail: drskayir@gmail.com

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[1] Hitit University, Erol Olçok Training and Research Hospital, Department of Anesthesiology and Reanimation, Çorum, Turkey.
[2] Hitit University, Erol Olçok Training and Research Hospital, Department of Critical Care, Çorum, Turkey.

ARAŞTIRMA

YOĞUN BAKIMDA TAKİP EDİLEN GERİATRİ YAŞ GRUBU HASTALARDA TRAKEOTOMİ

Öz

Giriş: Yoğun bakım ünitelerinde, çok sayıda geriatri hastalarının mekanik ventilasyona bağlanmaktadır. Uzun süreli mekanik ventilasyonu bağlı hastalar yüksek mortalite göstermektedir. Bu geriatri yaş grubu hastalar, trakeotomiden büyük ölçüde faydalanabilir çünkü trakeotomi akciğer bakımını kolaylaştırır, hasta konforunu arttırır ve mekanik ventilasyondan kurtulmalarına yardımcı olur.

Gereç ve Yöntem: Çalışmada mekanik ventilasyona bağlı toplam 70 geriatri yaş grubunda hasta alındı. Hastaların elektronik verileri, dosya kayıtları, yaş, cinsiyet, mekanik ventilasyon gereksinimi, Akut Fizyoloji ve Kronik Sağlık Değerlendirmesi II skoru, entübasyon ve yoğun bakım ünitesinde kalma süresi, taburculuk durumu ve komplikasyonları incelendi.

Bulgular: Ortalama hasta yaşı 78.6±7.4 yıl ve ortalama Akut Fizyoloji ve Kronik Sağlık Değerlendirmesi II skoru 27.0±5.9 idi. Ortalama 34.8±17 gün sonra trakeotomi yapıldı ve yoğun bakımda kalış süresi ortalama 94±54 gündü. Hastaların 1'inde majör (%1.4), üçünde (%4.2) minör kanama izlendi. Toplam 53 (%76) hasta öldü, 8 (%11) hasta taburcu edildi ve 9 (%13) hasta hala hastanede kaldı.

Sonuç: Geriatri yaş grubundaki hastaların yakınlarının trakeotomi yapma konusundaki isteksizliği, işlem süresini ve yoğun bakım ünitesinde kalma süresini etkilemektedir.

Anahtar sözcükler: Yoğun bakım; Geriatri; Trakeotomi; Yapay solunum

INTRODUCTION

Compared with intubation, tracheotomy provides better alveolar ventilation in patients requir-ing prolonged mechanical ventilation (1). Tracheotomy also facilitates pulmonary care, reduces dead space and airway resistance, increases patient comfort and helps wean patients off me-chanical ventilation. Tracheotomy is recommended in patients with respiratory failure who cannot tolerate extubation within 7–14 days (2). Percutaneous dilatational tracheotomy (PDT) confers a lower risk of wound infection than surgical tracheotomy and prevents risks associat-ed with the transportation of patients because it can be performed at the bedside. Currently, PDT has replaced surgical tracheostomy for patients treated in intensive care units (ICUs) (3).

The number of geriatric patients admitted to ICUs has considerably increased owing to the ageing population (4). Previous studies have shown that it is difficult to wean geriatric pa-tients off mechanical ventilators (5) and that they often die even before being discharged from the hospital (6). Reduced lung elasticity, weakened respiratory muscles and decreased lung capacity in geriatric patients render the weaning of mechanical ventilation difficult (7). Moreover, high mortality has been reported in geriatric patients requiring prolonged mechani-cal ventilation (8). Thus, many elderly patients may greatly benefit from tracheotomy. Long-term intubation should not be the only criterion for the indication of tracheotomy, and the need for tracheotomy in critically ill patients should be reviewed (2). In the present study, we aimed to retrospectively examine events of late tracheotomy in geriatric patients treated in ICU at a provincial education and research hospital.

MATERIALS AND METHOD

Patients aged >65 years who were treated with PDT between January 2015 and October 2018 were included in the study. This study was approved by the Ethics Committee of Hitit Uni-versity (2018-212) and was conducted in accordance with the World Medical Association Declaration of Helsinki. The patients' data records and follow-up forms were examined. Patients aged <65 years and those with missing data records or follow-up forms were excluded from the study.

Percutaneous dilatational tracheotomy indications considered at our clinic include prolonged mechanical ventilation, weaning failure, need for mechanical ventilation, presence of neurological disease, upper respiratory tract stenosis and frequent bronchial cleansing. PDT was never performed in the absence of family and/or patient consent, presence of bleeding diathesis (platelet count<60,000 mm^3/L; international normalised ratio>1.5), requirement of high oxygenation support (positive end-expiratory pressure>10 mmHg; FiO_2> 80%) and presence of cervical trauma.

At our clinic, PDT is performed following the standard Griggs forceps technique using supra-glottic airway devices with appropriate anesthesia induction. After each procedure, the suc-cess of tracheotomy is evaluated via clinical observation and postero-anterior chest radiog-raphy.

Patients' electronic data, file records, age, sex, mechanical ventilation-requiring diagnosis, Acute Physiology and Chronic Health Evaluation (APACHE) II score, intubation and ICU stay duration, discharge status (healthy, sequelae or mechanical ventilation) and complications (bleeding, subcutaneous emphysema, false pneumothorax passage, hypotension, hypoxia, tra-cheal injury or mortality) were recorded.

Statistical analyses

Data were analyzed using Statistical Package for the Social Sciences software for Windows (version 22.0; SPSS Inc., Chicago, IL, United States). Whether continuous variables were normally distributed was determined using the Kolmogorov–Smirnov test. Levene's test was used for evaluating variance homogeneity. Continuous data were presented as mean±standard deviation (sd); median (range) was used for skewed distributions. Categorical data were pre-sented as number of cases (%).

Differences in non-normally distributed variables between two independent groups were as-sessed using the Mann–Whitney U-test and those among more than two independent groups were assessed using the Kruskal–Wallis test. When the p-values from the Kruskal–Wallis test results were statistically significant, the post-hoc Conover–Iman test of multiple comparisons was used to assess which group differs from which others.

Degrees of relation between variables were evaluated using Spearman's correlation test. $p<0.05$ was considered statistically significant.

RESULTS

Data of total 85 patients who underwent PDT were analysed; after excluding 12 and 3 of those owing to age <65 years and missing data records, respectively, a total of 70 patients [33 (47%) males and 37 (53%)

Table 1. Demographic and other features.

Variable	n	%
Gender		
Male	33	47.1
Female	37	52.9
Age		
65 to 79	38	54.3
80 and above	32	45.7
Diagnosis		
Hypoxic encephalopathy	9	12.9
Chronic Obstructive Pulmonary Disease	14	20.0
Carcinomas	2	2.9
Stroke	18	25.7
Intracranial Hemorrage	8	11.4
Type-I Pulmonary Disease	18	25.7
Pulmonary Fibrosis	1	1.4
Discharge status		
Discharged	8	11.4
Still in the service	9	12.9
Exitus	53	75.7
Complication		
Arrhythmia	1	1.4
Bleeding	3	4.3
No	66	94.3

females] were finally included. The mean patient age was 78.6±7.4 years, and the mean APACHE II score was 27±5.9, indication day was 13.54±5.12, consent day was 30.94±16.37 days. Tracheotomy was performed after a mean duration of 34.8±17.6 days, and the mean ICU stay duration was 94±54 days. Indications for mechanical ventilation are summarized in Table 1.

Consent for tracheotomy was obtained from 7 of the patients' relatives before the 15th day of mechanical ventilation, and no tracheotomy was performed during that time. Results of the evaluation of the tracheotomy indication duration, time of obtaining consent and opening time according to follow-up and discharge groups are presented under Table 2. Table 3 presents a comparison of the patient groups aged 65–79 and >80 years. Table 4 presents results of the correlation analysis for the day of indication, approval and procedure; the results revealed a significant positive correlation between the duration of the procedure and the duration of ap-proval (high degree), indication (moderate) and admission day (moderate) ($p<0.05$). A posi-tive correlation was also observed between the duration of approval and indication (moderate; $p<0.05$).

Minor and major haemorrhage were noted in 3 (4.2%) and 1 (1.4%) patient, respectively, and tracheotomy cannula could not be established in 1 (1.4%) patient. Moreover, 54 (76%) pa-tients died during the study period; 8 (11%) were discharged and 9 (13%) are still hospital-ised.

DISCUSSION

We investigated the usefulness of PDT in geriatric patients treated in ICUs. In our patient cohort, tracheotomy was performed after a mean duration of 35 days, and the mean ICU stay duration was approximately 95 days. Various opinions have been reported regarding the tra-cheotomy opening time and benefits in patients treated in ICUs. A meta-analysis reported that tracheotomy procedures performed before the 10th day of mechanical ventilation had shorter ventilation duration, ICU stay duration and lower long-term mortality compared with proce-dures performed later than that (9).

Table 2. Evaluation of the patient groups.

Variable	Mean±sd Median (min–max)			p
	Discharged	In the Service	Exitus	
APACHE II	26.50±1.69 26.5 (24–29)	26.00±6.32 27 (16–35)	27.25±6.37 26 (12–46)	0.922
Procedure day	32.88±13.77 29.5 (16–58)	48.67±21.28 39 (32–100)	32.74±16.73 28 (8–94)	0.024[c]
Consent day	30.50±14.54 27 (10–55)	45.56±20.21 36 (30–93)	28.53±14.87 25 (6–85)	0.014[c]
Indication day	12.75±2.71 14 (7–15)	18.89±7.83 18 (10–35)	12.75±4.32 12 (5–25)	0.035[c]
Length of stay	73.75±31.59 72 (34–125)	111	94.06±59.63 81 (15–285)	0.626

Continuous variables were compared with the Kruskal–Wallis test. Conover-Inman test were performed for the binary comparisons among the groups and the p value was set at 0.05. Sig-nificant differences were found between: a, discharged vs in the service; b, discharged vs Exi-tus; c, in the service vs Exitus.

Turković et al. compared early and late tracheotomy and reported that the mechanical ventila-tion and ICU stay durations were shorter in patients who underwent early tracheotomy; however, they emphasized that tracheotomy did not affect the overall hospital stay duration (10). In their study involving 78 geriatric patients, Baskin et al. reported that those with respiratory failure were difficult to be weaned off the mechanical ventilator after tracheotomy. They also reported that those patients never recovered their swallowing ability, had to be fed via a gas-trostomy tube, that their vocal cord functions did not return and that they could not gain from the potential benefits of tracheotomy. They also reported that poorly diseased geriatric patients with respiratory insufficiency exhibited poor outcomes after tracheostomy, thereby sug-gesting that clinicians should assess which population would be appropriate for tracheotomy (2). Considering the opinions of patients and their relatives, an editorial article countering this research (11) reported that patients with very serious disease may benefit from a second visit. The prognosis of patients and their expectation of quality of life after discharge should be evaluated during patient visits. Freeman et al. performed tracheotomy in 2472 patients who received 43,000 ventilation supports; the mean time to tracheotomy was 10 days, the mean hospital stay duration was 37 days and the mean ICU stay duration was 17 days. The authors also emphasized the fact that more than one extubation trial was performed in their patients undergoing tracheotomy and that tracheotomy was perceived differently in rural areas and metropolises. In addition, mortality was lower in patients who underwent tracheotomy, and intensive care physicians desired to perform tracheotomy in patients who could be discharged from ICUs (12).

In the present study, tracheotomy was performed after a mean duration of 35 days and was reported as late tracheotomy in the literature. In our clinic, the most common indication of tracheotomy is unsuccessful weaning as stated in the literature, and in the case of intubation longer than 10 days, patients and their relatives are requested for consent for performing tra-cheotomy. When the evaluation was conducted according to age groups, the duration of indi-cation was 12 and 14 days for patients aged 65–79 and >80 years, respectively.

Table 3. Evaluation of the patient groups.

Variable	Mean±sd Median (min–max)		p
	65-79 years of age	65-79 years of age	
APACHE II	27.26±5.03 26 (18 – 40)	26.69±7.00 26 (12–46)	0.562
Procedure day	33.50±17.09 29 (8 – 100)	36.34±18.45 31.5 (14–94)	0.520
Consent day	30.63±16.63 27.5 (6–93)	31.31±16.31 29 (7–85)	0.869
Indication day	12.66±5.07 12 (5–35)	14.59±5.06 14 (7–25)	0.083
Length of stay	86.88±52.57 80 (15–190)	96.97±61.05 84 (28–285)	0.410

Continuous variables are expressed as either the mean±standard deviation (sd) or median (minimum–maximum).
Continuous variables were compared using the Mann–Whitney U-test.

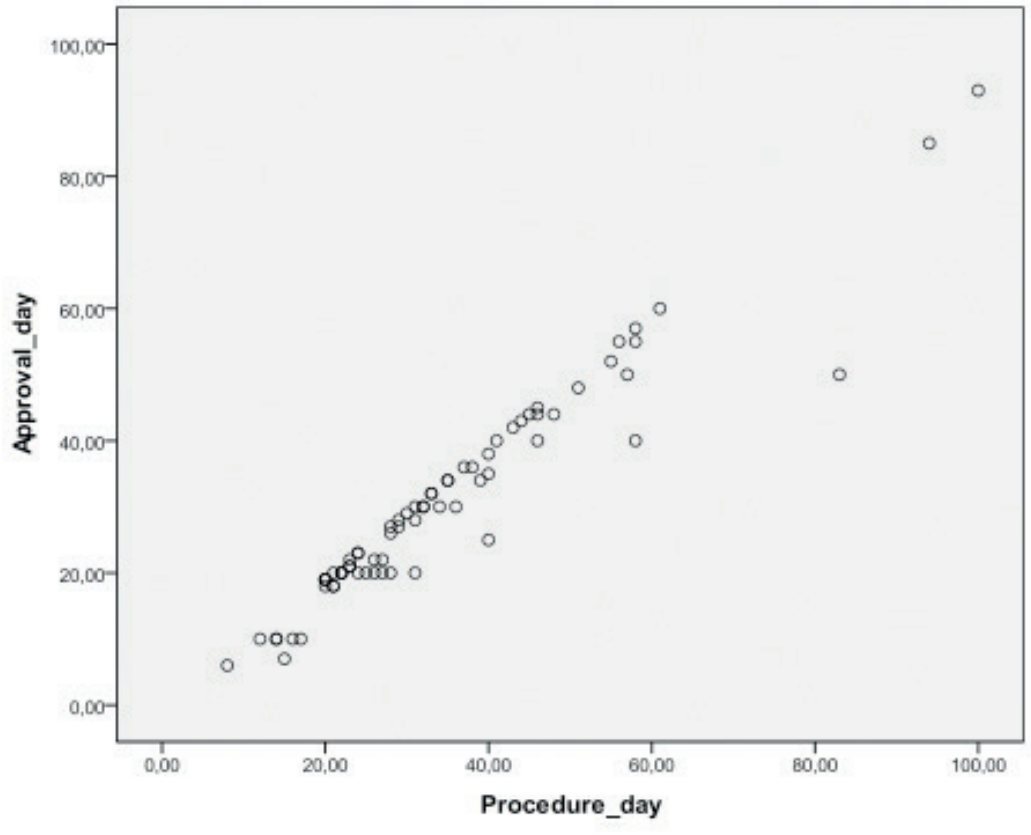
Table 4. Evaluation of the patient groups.

		Age	APACHE II	Procedure day	Consent day	Indication day
Age	**r**	1.000	−0.005	0.064	0.029	0.151
	p	.	0.970	0.597	0.812	0.211
	n	70	70	70	70	70
Apache II	**r**		1.000	0.027	0.045	0.014
	p			0.825	0.714	0.910
	n		70	70	70	70
Procedure day	**r**			1.000	0.970	0.554
	p			.	<0.001	<0.001
	n			70	70	70
Consent day	**r**				1.000	0.514
	p				.	<0.001
	n				70	70
Indication day	**r**					1.000
	p					
	n					70

Tracheotomy was not performed before the 15th day of mechanical ventilation. Consent for tracheotomy was obtained from the relatives of only seven patients, the durations to which were found to be 30.63 days and 31.31 days for patients aged 65–79 and >80 years, respectively. The dura-tions of the procedure following approval were 33.5 and 36.5 days for patients aged 65–79 and >80 years, respectively. A correlation was observed between the day of approval and the day of the procedure. Once tracheotomy was approved, the procedure was performed at the best time in our clinic. We think that the tracheotomies were performed in late period particularly in geriatric patients because of their low discharge expectancy by the relatives and be-cause the approval of the procedure was delayed. We also assume that, in accordance with the literature, the hospitalization duration depends on the delayed tracheotomy time (13).

The duration of tracheotomy was significantly shorter in patients who were discharged than in those who were followed up in the service and died. Patients who were still being followed up in the service were newly diagnosed respiratory failure patients. The tracheotomy indication for patients who underwent a weaning trial was relatively late. We have performed more than one weaning trials, the results of which are consistent with the study of Freeman et al. (12). However, we found that patients who were followed up in the service had a longer tra-cheotomy time than those who died. This is the result of our study against the literature.

Figure 1. Correlation between the time of approval and tracheotomy time.



Duran et al. examined 47 tracheotomy patients in a geographically western metropolitan area; their reported mean patient age was similar to that in our study. However, in their study, the average number of days to tracheotomy was 10.9 (14). Reason for the longer time to tracheot-omy in our patients compared with that in Duran et al.'s study can be the fact that in rural settings, similar to the one in our study, relatives do not expect geriatric patients to survive longer and are hesitant to approve a surgical procedure.

The mean ICU stay duration in our patients was approximately 94 days. The mean ICU stay duration was 37 days as per Freeman et al. (12), 30 days (15) as per Kollef et al. and 34 days as per Duran et al. (14). In the present study, ICU stay duration was considerably longer than that reported in the literature perhaps due to the fact that the patients' relatives were reluctant to accept the care of patients undergoing tracheotomy despite them being suitable for dis-charge. In our region, no palliative care centre has yet been established to treat such patients, and this has resulted in prolonged hospitalization durations and increased hospital mortalities. Therefore, the frequency of discharge to the palliative care service in our hospital was only 11%.

Haemorrhage, which was reported in 5.6% of the patients, was the most common complica-tion encountered in our study. A meta-analysis conducted by Delaney et al. reported that the average rate of haemorrhage across 10 randomized controlled

trials was 5.7%. Moreover, PDT was not associated with a higher risk of haemorrhage than was surgery (3). Cormick and Manara presented cases of three patients who died from innominate vein injury during PDT and recommended evaluating venous structures using ultrasonography (USG) before the pro-cedure. Moreover, they reported that the use of fibreoptic bronchoscopy during the procedure would help confirm the location of cannula (16). A meta-analysis conducted by Sanabria re-ported no differences between surgical and percutaneous techniques. The Ciaglia Blue Rhino method may be suitable for minor haemorrhages; however, the clinical experience and opera-tor skill required are critical (17). In the present study, no patient was lost to haemorrhage. Major haemorrhage occurred due to venous bleeding and was resolved via little bedside inter-vention using general surgery. We believe that venous structures should be evaluated using USG before the procedure. Moreover, anatomical variations may develop in geriatric patients due to fibrosis, ageing and decreased connective tissue volume; however, these complications can be avoided with adequate preoperative evaluation.

The tracheotomy cannula of one patient was not appropriately located, and re-intubation was performed due to lack of ventilation; the tracheotomy stoma was closed, and the patient was followed up with intubation. A false route may occur when the cannula opens at an incorrect location during the procedure. After a successful procedure, the tracheotomy cannula may be displaced during patient care or mobilization (18). An approximately 1% incidence rate of false route cannulation after PDT has been reported (12), which is consistent with our find-ings.

In conclusion, PDT is safe for geriatric patients. However, the reluctance of geriatric patients' relatives to perform tracheotomy affects the time of the procedure and the duration of ICU stay.

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■ Başak ÖKSÜZLER[1]
■ Gülay DİRİK[1]

RESEARCH

INVESTIGATION OF POST-TRAUMATIC GROWTH AND RELATED FACTORS IN ELDERLY ADULTS' EXPERIENCE OF SPOUSAL BEREAVEMENT

Abstract

Introduction: Spousal bereavement is an inevitable experience for elderly adults. Although it may have negative effects, spousal bereavement may also result into post-traumatic growth in the elderly. Studies on the relationships of such growth with different factors have revealed that psychosocial resources such as self-esteem, religious coping, and social support are related to the level of post-traumatic growth. Therefore, this study aimed to examine the relationship between these factors and post-traumatic growth in bereaved elderly.

Materials and Method: Participants included 163 bereaved people living in nursing homes (mean age=78.73±7.07, min-max=65–96). They completed the Socio-demographic Information Form and five self-report scales. Independent samples t-test and multivariate analyses of variance were performed to examine whether post-traumatic growth varies according to gender. Further, hierarchical regression analysis was conducted to determine the growth predictors.

Results: Results showed that widows reported a significantly higher level of growth, and being a woman predicted total growth and two subdimensions thereof. While negative religious coping predicted only total growth, positive religious coping predicted total growth and two subdimensions. Furthermore, perceived social support from friends predicted only total growth and that from significant others predicted total growth and two subdimensions. Self-esteem was not a growth predictor.

Conclusion: Because social support and coping strategies are related to post-traumatic growth, interventions focused on social support resources and coping process may be beneficial in facilitating growth in bereaved people. Moreover, supporting the elderly with basic everyday life skills will be functional in terms of preventive health policies.

Keywords: Aged; Widowhood; Posttraumatic growth, Psychological; Self-esteem; Social support

CORRESPONDANCE
Başak ÖKSÜZLER
Dokuz Eylül University, Department of Psychology, Izmir, Turkey.

Phone: +902323019406
e-mail: basakoksuzler@gmail.com

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[1] Dokuz Eylül University, Department of Psychology, Izmir, Turkey.

ARAŞTIRMA

EŞİNİ KAYBETMİŞ YAŞLI BİREYLERİN TRAVMA SONRASI GELİŞİM DÜZEYLERİ İLE İLİŞKİLİ FAKTÖRLERİN İNCELENMESİ

Öz

Giriş: Çoğu yaşlı birey için kaçınılmaz bir yaşam olayı olan eş kaybı, olumsuz etkilere yol açabilmekle birlikte travma sonrası gelişim yaşanmasını da sağlayabilmektedir. Gelişimin değişik faktörler ile ilişkisini inceleyen araştırmalar benlik saygısı, dini baş etme ve sosyal destek gibi psikososyal kaynakların gelişim düzeyi ile ilişkili olduğunu göstermiştir. Bu nedenle, bu çalışmada eşini kaybetmiş yaşlı bireylerde bu faktörlerin travma sonrası gelişim düzeyi ile ilişkisi incelenmiştir.

Gereç ve Yöntem: Çalışmaya huzurevlerinde yaşayan 163 katılımcı dâhil edilmiştir (ortalama yaş=78.73±7.07, min-max=65–96). Katılımcılar sosyo-demografik bilgi formu ve beş öz bildirim ölçeği doldurmuşlardır. Travma sonrası gelişim ve alt alanlarının cinsiyete göre değişip değişmediğini belirlemek amacıyla bağımsız örneklemler t testi veçok değişkenli varyans analizi, gelişimin ve alt boyutlarınınyordayıcılarının belirlenmesi amacıyla hiyerarşik regresyon analizi kullanılmıştır.

Bulgular: Kadınların erkeklerden daha fazla travma sonrası gelişim bildirdiği ve kadın olmanın hem toplam gelişim puanı hem de gelişimin iki alt boyutunun yordayıcısı olduğu belirlenmiştir. Olumsuz dini baş etme yalnızca toplam gelişimi yordarken; olumlu dini baş etme, hem toplam gelişim hem de gelişimin iki alt boyutunun yordayıcısı olarak bulunmuştur. Arkadaşlardan alınan sosyal desteğin yalnızca toplam gelişimi; önemli diğerinden algılanan sosyal desteğin ise hem toplam gelişim hem de gelişimin iki alt boyutunu yordadığı belirlenmiştir. Benlik saygısı ise gelişimi ve alt alanlarını yordamamıştır.

Sonuç: Sosyal destek ve baş etme stratejilerinin gelişim ile ilişkili bulunması nedeniyle bu süreçlere odaklanan müdahalelerin kayıp yaşamış yaşlı bireylerin gelişim düzeylerini artırmak için faydalı olabileceği düşünülmüştür. Ayrıca yaşlı bireylerin temel günlük hayat becerileri konusunda desteklenmesi koruyucu sağlık politikaları açısından işlevsel olacaktır.

Anahtar sözcükler: Yaşlılık; Eş Kaybı; Travma sonrası gelişim; Benlik saygısı; Baş etme; Sosyal destek

INTRODUCTION

Bereavement is one of the most difficult developmental experiences during old age (1). Loss of a spouse may be traumatic forthe surviving spouse. Research has revealed that bereavement is accepted and viewed as trauma (2). Despite negative effects resulting from the life crisis or trauma, positive effects may also be experienced. Post-traumatic growth (PTG) refers to positive changes after compelling and stressful life experiences; it encompasses both coping mechanisms and ongoing experiences (3). Although there are many explanations for PTG, Tedeschi and Calhoun's Post-traumatic Growth Theory is the most comprehensive and accepted model. According to this model, PTG has three dimensions: changes in self-perception (SP), changes in relationships with others (RWO), and changes in philosophy of life (PL). These dimensions involve experiencing increased strength and self-efficacy about problems that may occur in the future, positive changes in interpersonal relationships and increased feelings of intimacy, a re-evaluation of life's priorities, and a deep existential perspective (4). It is crucial to struggle and make an effort to adjust to a traumatic life crisis to experience growth. Searching for meaning about the traumatic experience is important for PTG because an individual is prompted to make changes to former assumptions after the trauma (3). PTG is a process of change that can lead to a different perspective about life. Spousal bereavement may require reorganization of life and openness to experiences and struggles that would follow. Hence, the loss of a spouse may motivate elderly adults to change (5).

According to Tedeschi and Calhoun, factors such as personality traits, coping strategies, social resources of individuals, and socio-demographic variables can affect the level of PTG (3). Self-esteem is an important personal factor that plays a crucial role as a coping resource in adverse life events (6). Similarly, social support, another resource employed to face difficult life experiences, can stimulate PTG by providing a framework for changes in an individual's life (3). Religious coping strategies (RCOPE) are also associated with PTG in that they help make sense of the severe consequences of adverse life events. Positive religious coping (PRCOPE) is based on the notion of a secure relationship with God and the ability to find meaning in the struggle of life. On the contrary, negative religious coping (NRCOPE) reflects an insecure relationship with a more judgmental God, and vital crises are viewed as an individual self-examination. Although the term is headed by the word "negative," in fact, this process facilitates growth to the same extent as PRCOPE (7). Both coping strategies advance to growth by means of questioning and reframing both life and the crisis (8). In the socio-demographic context, the majority of related research indicates that women are experiencing more growth; however, findings concerning age vary, such that some researchers have reported that being younger is associated with growth, whereas others have proposed the opposite condition (9).

Owing to the increased likelihood of mortality as age progresses, spousal bereavement is an inevitable life crisis and source of complexity for the elderly. Such losses may be underestimated because of their developmental stage. However, changes and problems after the loss can be more distressing for elderly individuals, as they lead to altered economic and identity roles. In some cases, traditional social roles result in a lack of knowledge and skills to manage the tasks previously handled by the deceased spouse, which further complicates situations for the elderly (10). The literature on PTG is generally within the framework of chronic diseases, accidents, or terrorist attacks, whereas common life stressors such as spousal bereavement have often been neglected. Because of multiple studies have shown growth is possible after life challenging crisis, the first aim of this study was to examine the level of growth in the elderly bereaved people living in nursing homes. The study's second aim was to broaden our understanding of PTG in terms of which resources facilitate growth in this

population by identifying predictors of total PTG and its subdimensions. With reference to these aims, it was hypothesized that women would report greater levels of PTG than men, and that self-esteem, perceived social support, and RCOPE would be related to PTG and its subdimensions. A major strength of the study is that it is among the first to examine PTG in the context of typical life crises among a bereaved elderly population. The findings of this investigation could be significant for future research in this area, including interventions aimed at enhancing life satisfaction and taking protective measures for elderly people's mental health.

MATERIALS AND METHOD

Participants

The participants were recruited through nursing homes in Bursa (46%), İzmir (45.3%), Ankara (5.6%), and Eskişehir (3.1%).The criteria to participate in the present study included obtaining a score of 23 or more in the Standardized Mini Mental State Examination Test (SMMT) (11, 12) and experiencing spousal bereavement at least before a year. The participants included 163bereavedwomen (54.7%) and men (45.3%). The age of the total sample ranged from 65 to 96 years (mean age: 78.73 years±7.07years).

Assessment tools

Socio-demographic Information Form: It was developed to obtain information about various demographic features and religiousness level of the participants as well as details concerning their bereavement (e.g., cause of death and time since the loss).

Multidimensional Scale of Perceived Social Support: This scale evaluates social support by family members (SFAM), friends (SF), and significant others (SSO)(13). It consists of 12 items on a 7-point scale (1=strongly disagree; 7=strongly agree). Eker and Arkar adapted the scale for Turkish respondents; the total score ranges from 7 to 84, and higher scores indicated more perceived social support (14). In the present study, Cronbach's alpha was 0.92, 0.85, 0.90, and0.84 for SFAM, SF, SSO, and overall, respectively.

Rosenberg Self-Esteem Scale: This is a self-report measure consisting of ten items that evaluate an individuals' self-esteem on a 4-point scale (1=strongly agree; 4=strongly disagree). The total score ranges from 10 to 40, and a high score indicates high self-esteem. In relation to both Turkish validity and reliability studies of the scale and the present study, Cronbach's alpha was found 0.75 (15).

Religious Coping Scale (RCOPE):): The RCOPE consists of 14 items that assess employing PRCOPE and NRCOPE (8). It is a self-report measure on a 4-point scale (1=not at all; 4=a great deal). High scores indicate a higher level of employing a particular religious coping style. The Turkish version of the scale has been used as a reliable and valid scale in the literature (16). In the present study, Cronbach's alpha was 0.82, 0.77, and 0.82 for PRCOPE, NRCOPE, and total religios coping, respectively.

Geriatric Depression Scale: It is a self-report measure used to identify the depression in elderly and consists of 30 items wherein respondents are required to answer Yes/No (17). The total score ranges from 1 to 30, and scores that are higher than14 denote depression. In validity and reliability studies for Turkish population, Cronbach's alpha was found 0.92 (18). In this study, it was 0.86 for the scale.

Post-traumatic Growth Inventory (PTGI): The PTGI assesses positive changes perceived as a result of coping with trauma. It is a self-report measure that consists of 21 items on a 6-point scale (0=I did not experience this change as a result of my crisis; 5=I experienced this change to a very great degree) (4). Unlike the original, Turkish psychometric studies revealed three subdimensions; namely, changes in SP, RWO, and PL, with Cronbach's alpha values0.88,

0.86, and 0.87, respectively, and 0.94 for total PTG (19). In the present study, Cronbach's alpha was 0.76, 0.68, 0.80, and 0.85 for changes in SP, RWO, PL, and overall PTG, respectively.

Procedure

The participants completed the Socio-demographic Information Form and the six scales. Before administration, approval from the nursing homes and ethical approval from Dokuz Eylül University Ethical Committee of the Faculty of Arts were obtained. The researchers informed the participants about the aim and procedures of the study, and informed consent was obtained from all the participants. First, the researchers administered SMMT and evaluated the prospective participants' cognitive assessment. Individuals who scored lower than 23, had married someone else after their bereavement, diagnosed for any psychiatric diagnosis, or used psychiatric medicine were excluded. Participants who had been married and experienced spousal bereavement more than once were asked to consider the last bereavement when answering the questions.

Statistical analysis

Data obtained from the participants were analyzed by using the SPSS 16. An independent sample t-test and multivariate analyses of variance (MANOVA) were conducted to examine gender differences in PTG, social support, RCOPE, and self-esteem. Pearson Correlation analyses were conducted to evaluate correlations between the variables, and hierarchical regression analyses were conducted to determine predictors of PTG and subdimensions.

RESULTS

Characteristics of marital relationship and the loss

Participants were asked to provide information related both to characteristics of their marital relationship (duration, satisfaction with marriage) and their spousal loss (cause of death, time since the loss). The mean marriage duration was 33.33±16.11 years. The mean value of participants' marriage satisfaction (determined by asking how satisfied they were with their marriage on 5-point scale) was 3.97±1.30. Causes of death were disease lasting more than three months (53.4%), acute illness (36%), accident (8.7%), murder (1.2%), and natural disaster (0.6%). The mean of time since the loss was 19.3±13.28 years.

Correlations between variables

Pearson correlations were calculated to evaluate correlations between the variables. The results indicated that total PTG was negatively related with gender (1=female, 2=male), whereas it was positively related with SFAM, SF, and SSO; total RCOPE; and PRCOPE and NRCOPE. SP was negatively related with gender whereas positively related with years of living in nursing homes, RCOPE, PRCOPE, and NRCOPE. RWO was negatively related with gender whereas positively related with total health problems (a sum of all of their health problems); total perceived social support, SF, SSO; and RCOPE, PRCOPE, and NRCOPE.PL was negatively related with gender, satisfaction with marriage (determined by asking how satisfied they were with their marriage on a 5-point scale), and depression. On the contrary, it was positively related with health perception (determined by asking how they assess their own health on a 5-point scale), total perceived social support, SSO, RCOPE, PRCOPE, and self-esteem.

Post-traumatic growth level of the sample and gender differences on the measures of the study

Prior to the analyses, the data were screened to evaluate whether they confirmed the assumptions, at which point two cases identified as multivariate outliers were deleted. Analyses were carried out with the remaining 161 cases.

The participants' total mean PTGI score was 75.68±13.93, and the mean scores for PTGI factors, namely, changes in SP, RWO, and PL were 5.83±6.21,

24±5.54, and 15.83±5.53, respectively. Independent sample t-tests were conducted in order to determine the difference between women's and men's PTG levels, and widows (M=79.44, SD=12.48) reported significantly more growth than widowers (M=71.15, SD=14.31) for total PTG [t(159)=3.92, p<.001]. MANOVA was conducted to determine gender differences on the subdimensions of PTG, and the results revealed a significant main effect of gender [Wilks' Λ=.91, F(3, 157)=5.32, p=.002, ηp^2=.09]. A Bonferroni correction was conducted to assess the significance of univariate analyses and alpha values lower than.016 (i.e.,.05/3) were accepted as significant. After this correction, a significant main effect of gender was observed for SP [F(3,157)=12.74, p<.001], RWO [F(3,157)=9.94, p=0.002], and PL [F(3,157)=6.59, p=0.011]. The results indicated that widows reported higher levels of SP (M=37.375, SE=0.639; M=33.986, SE=0.702), RWO (M=25.227, SE=0.575; M=22.534, SE=0.631), and PL (M=16.841, SE=0.58; M=14.630, SE=0.637) than widowers.

MANOVA was used to determine the effect of gender differences on the social support and religious coping. The results showed that the main effect of gender on social support was significant [Wilks' Λ=.94, F(3, 157)=3.35, p=.002, ηp^2=.06].A Bonferroni correction was conducted, and alpha values lower than.016 (i.e.,.05/3) were accepted as significant. Regarding this correction, a significant main effect of gender was observed only for SFAM [F(1, 159)=5.61, p=.01, ηp^2=.03). The results indicated that women (M=21.045, SE=0.893) reported higher levels of family support than men (M=17.904, SE=0.981).Regarding gender differences in religious coping, because the test of equality of covariance matrices was found to be statistically significant, Pillai's Trace was used instead of Wilks' Lambda. The results showed that main effect of gender was significant [Pillai's Trace=.06, F(2,158)=5.84, p=.004, ηp^2=.06]. A Bonferroni correction was conducted, and alpha values lower than.025 (i.e.,.05/2) were accepted as significant. Regarding this correction, a significant main effect of gender was observed only for PRCOPE [F(1,159)=5.61, p=.03, ηp^2=.02]. According to these results, women (M=25.136, SE=0.421) reported higher levels of using positive religious coping than men did (M=23.822, SE=0.462). Additionally, independent sample t-test was used to examine gender differences in relation to self-esteem. However, no significant difference was found between widows and widowers [t(159)=1.81, p=.07].

Predictors of Total PTG

Four hierarchical regression analyses using the same set of independent variables were conducted in order to determine predictors of PTG and its subdimensions. In the first step, gender (1=female, 2=male), age, years of education, satisfaction with nursing home, years of living in a nursing home, and depression were entered into the regression analyses, and then the personal resources PRCOPE and NRCOPE, self-esteem, and SFAM, SF, and SSO were entered in the second step. Mean and standard deviation values of these variables are presented in Table 1.

The hierarchical regression analysis revealed that 12% variance explained by the first step was significant (F(6,154)=3.62, p=0.002, R2=.20), and gender contributed significantly to the regression model(t=-3.90, p<.001). Entering the personal resource variables explained an additional 20% of variation in growth, and this change in R^2 was significant, (F(6,148)=7.27, p<0.001).All the variables explained 32% of the variance [F(12,160)=5.89, p<0.001].In the final model, PRCOPE (t=3.60, p<.001, r=0.28); NRCOPE (t=2.05, p<.01, r=0.17); SF (t=2.20, p<.05, r=0.18); and SSO (t=2.30, p<.05, r=0.19) were positively correlated, and gender (t=-3.36, p=.001, r=-0.27) was negatively related with total PTG. In other words, PTG is enhanced if one uses religious coping and receives support from family and significant others. Furthermore, being a woman appears to be associated with a greater PTG level.

Table 1. Descriptive statistics of predictors.

Variable	Mean	sd	Min-Max
Gender*			
Age (year)	78.73	7.07	65-96
Education (year)	5.08	3.71	0-17
Satisfaction with nursing home	3.90	1.05	1-5
Living nursing home (year)	5.55	4.91	0.08-20
Depression	12.70	6.27	0-29
PRCOPE	24.54	3.99	7-28
NRCOPE	13.65	4.75	7-27
Self-esteem	28.01	4.05	18-40
SFAM	19.62	8.49	4-28
SF	15.97	6.95	4-28
SSO	17.96	7.65	4-28

*1=female, 2=male

Predictors of changes in SP

The results showed that at the first step, gender (t=-3.48, p=.001) and the length of living in nursing home (t=2.43, p=.02) contributed significantly to the model and accounted for 13% of the variance (F(6,154)=3.96, p=0.001). The second step explained an additional 14% of the variation in SP, and this change in R^2 was significant, F(6,148)=4.80, p<0.001.All the variables explained 27% of the variance [F(12,160)=4.70, p<0.001]. In the final model, PRCOPE (t=4.03, p<.001, r=0.31) and years of living in nursing homes (t=2.45, p=.01, r=0.19) were positively related whereas gender (t=-2.80, p=.01, r=-0.22) was negatively related to changes in SP.

Predictors of changes in RWO

The first step revealed that gender (t=-3.01, p=.002) contributed significantly to the model and accounted for 9% of the variance (F(6,154)=2.54, p<0.02). Entering the personal resource variables explained an additional 20% of variation in growth, and this change in R^2 was significant, F(6,148)=6.90, p<0.001. All the variables explained 29% of the variance [F(12,160)=5.02, p<0.001]. In the final model, SF (t=3.79, p<.001, r=0.29) and SSO (t=2.05, p=.04, r=0.17) were positively related with RWO, whereas gender (t=-3.25, p=.001, r=-0.26) was negatively related.

Predictors of changes in PL

The results of the first step showed that gender (t=-2.72, p=.01) and depression (t=-2.37, p=.02) contributed significantly to the model and accounted for 11% of the variance (F(6,154)=3.28, p<.05). The second step explained an additional 13% of the variation in PL, and this change in R^2 was significant (F(6,148)=4.26, p=.001). All the variables explained 24% of the variance [F(12,160)=3.98, p<.001]. In the final model, SSO (t=2.69, p=.01,

Table 2. Predictors of total ptg and three subdimensions.

Final model: Predictors	PTG (total)		SP		RWO		PL	
	β	t	β	t	β	t	β	t
Gender	-.30	-3.36***	-.22	-2.80**	-.25	-3.25*	-.14	-1.80
Age	-.05	-.71	-.04	-.60	-.03	-.37	-.05	-.70
Education (year)	-.10	-.10	-.10	-1.22	-.15	-1.81	.10	.81
Satisfaction of nursing home	.05	.63	-.00	-.03	.04	.60	.10	.10
Living nursing home (year)	.04	.63	.18	2.45**	-.04	-.61	-.04	-.60
Depression	-.15	-1.67	-.14	-1.51	-.03	-.40	-.20	-1.96
PRCOPE	.27	3.60***	.32	4.03***	.14	1.80	.19	2.39*
NRCOPE	.16	2.05**	.09	1.14	.20	1.91	.15	1.77
Self-esteem	.00	.04	.04	.41	-.10	-.90	.05	.53
SFAM	.04	.51	.00	.04	-.00	-.04	.09	1.22
SF	.20	2.20*	.13	1.64	.30	3.79***	-.02	-.30
SSO	.20	2.30*	.10	.74	.20	2.05*	.22	2.69*
F change	7.27***		4.80***		6.90***		4.26*	
R2	.20		.14		.20		.13	

***p<.001, **p<.01, *p<.0

r=0.29) and PRCOPE (t=2.39, p=.02, r=0.29) were positively related to PL. Table 2 summarizes the results of hierarchical regression analyses.

DISCUSSION

This is the first comprehensive study examining the relationships among personal and social resources related to PTG in bereaved elderly in Turkey. The first aim of this study was to assess levels of PTG in the elderly. The total scores of PTG obtained from the current sample revealed that the bereaved elderly experienced a moderately high level of growth relative to other samples (19). This finding may be related to the particular sample of elderly individuals and to the nature of their life crisis. Loss of a spouse may remind the elderly of their own mortality; their thoughts may include, "Life will end and being alive is invaluable. "Bereaved individuals may experience a sense that they should reconsider their priorities in life. A life-long partnership interrupted by an inevitable life event such as death may result in individuals feeling stronger because of facing struggles alone; accordingly, this may enhance the experience of growth. Results revealed that the years of living in a nursing home were only associated with changes in SP. Accordingly, the more years spent in a nursing home, the greater one's SP. After the death of a spouse, individuals may have had to adaptor the nursing home environment and realized that they could carry on with life without a spouse. Furthermore, the results revealed that women reported significantly more growth than men for overall PTG and the three subdimensions. Additionally, being a woman was a PTG predictor. This finding may be related to different aspects of marriage. Marriage has its own social, emotional, and instrumental aspects for both genders. Generally, a man appears to perceive his wife as the primary resource of emotional support (10, 20). Because men depend on women for many vital tasks in our culture, women may adapt to living alone easily after conjugal loss.

The findings indicated that the relationship between total PTG and PRCOPE (r=0.33, p<0.01) was stronger than that between PTG and NRCOPE (r=0.19, p<0.05). The MANOVA results suggest that widows have a higher tendency to use PRCOPE, which might explain why women reported higher levels of growth than men. Additionally, it was found that both types of RCOPE were predictors of PT. It is suggested that a life crisis such as spousal bereavement may damage people's assumptions and schemas, thereby resulting into efforts to find meaning in the loss with difficult feelings (3). Spiritual and/or religious beliefs have a major impact on finding meaning in the loss of loved ones. Using RCOPE in the face of "life-altering events," regardless of the "negative," can lead to changing perspective about the world after spiritual questioning; thus, the loss may be described as "part of the plan of God" by the individual and may result in a deeper spiritual understanding (8,21,22). A bereaved elderly may accept this situation and change personally and spiritually. Through the existential struggle after the loss and through the process of sense-making, bereaved people may experience growth regardless of their type of RCOPE and believe that life is a one-time chance.

Social support is another important resource for PTG (23). Although total perceived social support was correlated positively with total PTG, regression analysis revealed that it was not a PTG predictor. When examined in more detail, it was found to be noteworthy that SF and SSO predicted PTG. Support from friends may be more beneficial than family support for the emotional problems experienced by the person who has lost a spouse (24). The results also showed that women tended to perceive more support from their families. This can be explained by a greater tendency of women to build intimate relations with family members and friends, whereas men tend to receive support from their spouses for a range of social relationships. Moreover, older women are more likely than men to gain benefits from social networks (5). Furthermore, in Turkish

society, support from family may be perceived as something ordinary. In essence, perceived social support by the elderly appears important with regard to positive changes after the loss and to promoting emotional well-being.

Self-esteem was positively correlated with only changes in PL. On the contrary, regression analyses showed that self-esteem was not a PTG predictor. This finding is not in accordance with studies that have found that high self-esteem is related to PTG (7). Skills deficiencies are more prominent for those who have been married for many years, thus rendering the process of loss even more difficult. Self-esteem is an important characteristic for adjusting to changes and gaining new skills after a loss (25). However, the convenience of living in a nursing home may compensate for such shortcomings in bereaved older individuals. Thus, for elderly widows/widowers living in nursing homes, other resources may be more beneficial for one's perspective of life after the loss.

Although the findings of this study have contributed to existing literature, it has several limitations such as the utilization of a cross-sectional design, self-report scales, and a sample of participants living in nursing homes. Finally, as a clinical implication, interventions should focus on increasing social support resources and coping strategies to foster PTG. Moreover, supporting older adults in skills that transcend gender role boundaries would be beneficial for preventive health policy.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Candan MANSUROĞLU[1]

RESEARCH

IMPACT OF SPINAL AND GENERAL ANESTHESIA ON HS-TROPONIN IN GERIATRIC PATIENTS

Abstract

Introduction: We compared the myocardial injury risk of selective spinal anesthesia and general anesthesia with using peri operative plasma high sensitive- cardiac troponins in geriatric noncardiac surgery patients.

Materials and Method: We planned the study as prospective, randomized and double blinded. The study group was consisted of American Society of Anesthesiologist score I- II over 65 years old 46 preoperative non- cardiac surgery patients which randomly separated into the general or selective spinal anesthesia groups. Demographic characteristics of the groups were nearly the same. Anesthesia was performed via injection of bupivacaine 5 mg in Lumbar 4-5 intervertebral space in selective spinal anesthesia group, and propofol and remifentanil for anesthesia induction and then desflurane inhalation with laryngeal mask for anesthesia maintenance in general anesthesia group. Patients' 12 lead electrocardiograms and high sensitive- troponins were taken on the day of operation and postoperative day 1, 2 and 3.

Results: In this study any cardiac complication was observed and high sensitive- Troponin T levels were at the normal range of mean of 13.90±4, 24 ng/ (95% CI, 8.90-18.20; p=0.43). High sensitive-Troponin T was slightly increased the near significant of a mean19.34± 3.2 ng/L(95% CI, 15.43- 23.52; p= 0.05) in spinal anesthesia group than general anesthesia on postoperative third day.

Conclusion: Any distinct difference in myocardial injury was not observed between low risk non cardiac operations in the elderly with selective spinal anesthesia and with general anesthesia methods in our study. However, the third day increase in high sensitive-Troponin in selective spinal anesthesia group needs larger studies with longer follow- up in moderate to high risk patients in clinical practice usage.

Keywords: Aged; Anesthesia; Surgical Procedures, Operative; Postoperative complications; Troponin

CORRESPONDANCE
Candan MANSUROĞLU
Ankara Numune Research and Education Hospital, Cardiology Department, Ankara, Turkey.

Phone: +903125084776
e-mail: camansuroglu@hotmail.com.tr

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[1] Ankara Numune Research and Education Hospital, Cardiology Department, Ankara, Turkey.

ARAŞTIRMA

GERİATRİ YAŞ GRUBU HASTALARDA SPİNAL VE GENEL ANESTEZİNİN HS- TROPONİNE ETKİSİ

Öz

Giriş: Geriatrik hastalarda non- kardiyak cerrahi işlemlerde selektif spinal anestezi ile genel anestezi metodlarının kardiyak hasar oluşturma riskini perioperatif plazma high sensitive- troponin T ile karşılaştırdık.

Gereç ve Yöntem: Çalışmayı prospektif, randomize ve çift- kör olarak planladık. Çalışma grubu Amerikan Anestezi Derneği skorul-II olan 65 yaş üzeri, rastgele selektif spinal anestezi ya da genel anestezi gruplarına ayrılmış46 alt ekstremite ameliyatı hastasından oluşmuştur. Her iki grubun demografik özellikleri benzerdi.Selektif spinal anestezi grubunda anestezi, Lumbar 4-5 spinal seviyeye 5 mg bupivakain enjeksiyonu ile genel anestezi grubunda ise propofol ve remifentanil ile indüksiyon sonrası idame laringeal maske ile desfluran inhalasyonu ile sağlandı. Operasyon gününde ve postoperatif 1, 2 ve 3. günlerde, 12- derivasyon elektrokardiyogramları çekildi ve plazmahigh sensitive- troponin T çalışıldı.

Bulgular: Hastalarda kardiyak komplikasyon görülmedi ve high sensitive- troponin seviyeleri ortalama13.90± 4.24 ng/ L(%95 GA, 8.90-18.20; p=0.43) normal sınırlarda idi. Selektif spinal anestezi grubunun 3. günde high sensitive- troponin seviyeleri ortalama 19.34± 3.2 ng/L (%95 GA, 15. 43- 23, 52; p= 0.05) ve anlamlıya yakın yüksekti.

Sonuç: Çalışma sonuçlarımızda, düşük risk grubunda ki yaşlı hastaların alt ekstremite ameliyatlarında selektif spinal ve genel anestezi uygulamaları arasında kardiyak hasar açısından belirgin bir fark görülmedi. Ancak, selektif spinal anestezi grubunda 3. günde ki yükselmenin klinik pratikteki önemini anlamak için, orta- yüksek ve yüksek riskli hasta gruplarında, daha büyük ve uzun dönem takipli çalışmalara ihtiyaç olduğu sonucuna vardık.

Anahtar sözcükler: Yaşlı; Anestezi; Kalp-dışı cerrahi; Postoperatif komplikasyon; Troponin

INTRODUCTION

Aged people is increasing with the result of better living conditions and improved technological development in our country as in the world. According to World Health Organization (WHO), 1.2 million people will be 65 years old and over in 2025, and this number will reach 2 million in 2050 (1,2). Nearly half million patients undergo a major surgery annually worldwide and postoperative complications are becoming an increasing problem in aged people (3). The 30- day mortality is 2 % in moderate to high cardiac risk patients and 5% in high cardiac risk patients (4-6). Mortality occurs mostly frompostoperative cardiopulmonary complications especially from acute myocardial infarction(AMI) which sometimes may be silent or occur without a symptom in sedated and anesthetized patient (7,8). One million patients die from perioperative AMI yearly (9). Nagele et al found that preoperative cardiac troponins can be a specific, sensitive and rapid biomarker for categorising the risk for AMI and mortality in preoperative patients (10). Recent studies denoted that even a slight increase troponins were associated with myocardial injury and increased risk of cardiac complications (11-13). High sensitive- cardiac troponins(hs- Tc) assays which were introduced to detect the low level of troponins and are positive for myocardial ischemia even other cardiac enzymes are normal (14-16). The studies investigating safer anesthetic method in aged patients showed different results any valid opinion is not present. In this study, we aimed to detect the myocardial ischemia via measuring perioperative hs- cT's to find out the safer anesthetic method in geriatric patients undergoing a non cardiac operation.

MATERIALS AND METHOD

Study population

Following getting our trial permission from our hospital local ethics and trial committee and collection of informed consent, 46 American Society of Anesthesiologist score (ASA) I-II patients over 65 years of age who were scheduled to undergo elective orthopedic lower limb surgery and randomized in two groups: Group S (n=23) and Group G (n=23) undergoing surgery with selective spinal or general anesthesia. The trial number was 13/ 2017 and designed as prospective, randomized, double-blind study and conducted between May and October 2018 in at our hospital orthopedics clinics. The study were performed by the personal unaware of clinical outcomes. Anesthesia doctors and technicians were collected the blood samples but didn't know the analysis groups. The technicians, physicians and analysts who performed the tests were not informed about the study. Patient characteristics were listed in Table 1. A Mallampati score >2, long QT syndrome (acquired or congenital), cardiovascular disease, chronic obstructive lung disease, diabetes mellitus, chronic alcohol and drug using patients were excluded from the study. Hemodynamic monitoring datas that are consist of peripheral oxygen saturation (SpO_2), heart rate (HR)and mean arterial pressure (MAP) were evaluated preoperative section and patients didn't get any premedication. Propofol and remifentanil were used to get the anesthesia induction and endotracheal intubation was performed after neuromuscular block with 0. 1 mg kg- 1 rocuronium in Group G. Maintenance of anesthesia was ensured with 50% N_2O/O_2 and 2- 2. 5% sevoflurane inhalation. When the patients were in the sitting position 15 mg 0. 5 % hyperbaric bupivacaine were given to the L4-L5 space in the midline to get the spinal anesthesia in Group S. The pinprick test and the Bromage scale were used for sensory and motor block. Surgery was started when the T10 level sensory block was reached.

Biomarker assays

Blood samples were collected in serum separation tubes and centrifuged and 12-lead electrocardiogram (ECC)'s were taken on preoperative (baseline) and the mornings of postoperative days 1, 2, and 3. Samples were

Table 1. Descriptive statistics of predictors.

Study sample (n= 46)	Group G (n= 23)	Group S (n= 23)	p
Mean age, y (sd)	74.2±2.4	76±4.5	0.35
Female sex, n (%)	14(60.8)	16(69.5)	0.23
Smoking history, n (%)	8(34.7)	6(27.0)	0.14
Diabetes, n(%)	10(23.2)	7(20.7)	0.19
Hypertension, n(%)	10(23.2)	11(25.5)	0.32
Hypercholesterolemia, n(%)	7(30.4)	9(39.1)	0.45
Creatinine, mg/dL, mean±sd	1.0±0.4	1.1±0.8	0.45
Coronary artery disease, n(%)	-	-	-
Atrial fibrillation, n(%)	-	-	-
Lee's revised cardiac risk index			
1	14(60.6)	17(73.9)	0.42
2	9(39.1)	6(26.0)	0.39
3	-	-	-
4	-	-	-
Medications			
Aspirin, n (%)	5(21.7)	7(30.4)	0.35
Clopidogrel, n (%)	-	-	-
Warfarin, n (%)	-	-	-
B- blocker, n (%)	1(0.43)	0(9.3)	0.78
Statin, n (%)	-	-	-
ACE inhibitors, n (%)	3(13.04)	4(17.39)	0,17
Calcium-channel blocker, n (%)	5(21.7)	4(17.9)	0.56
ARB, n (%)	1(4.3)	2(8.6)	0.67
Nitrates, n (%)	-	-	-
Diuretics, n (%)	-	-	-

separated into aliquots and were frozen -80° C until they were assayed. Biomarker measurements were carried out in batches and no more than 2 freeze thaw cycles. Hs-cTnT concentrations (presented as nanograms per liter equal to picograms per milliliter) were measured by on Cobas e601 autoanalyzer (Roche Diagnostics, Germany). Measurable Ranges were 3- 10000 ng/L or pg/mL (limit of detection 5 ng/ L).

Statistical analysis

SPSS soft ware (Version 18. 0, SPSS Inc. Chicago, IL, USA) were used for statistical analysis. Variables was analyzed using the Kolmogorov-Smirnov test. Categorical variables were presented as percentages and parametric variables were presented as mean±standard deviation. Non-parametric variables were expressed as median (minimum-maximum). The normally distributed

Table 2. Hs- cTnT levels in ng/L±sd before surgery and on postoperative day 1, 2 and 3.

Hs- cTnT,ng/ L± sd	Group G (n=23)	Group S (n=23)	p
Before surgery, ng/L	15.90±4.24	12.42± 5.01	0.27
Postoperative day 1, ng/L	13.25±1.941	10.89±1.19	0.45
Postoperative day 2, ng/L	12.56±2.59	11.32± 4.04	0.40
Postoperative day 3, ng/L	13. 09±4.32	19.34±3.2	0.05

numeric variables were analyzed with the Student's t-test, and non-normally distributed variables were evaluated by the Mann–Whitney U test variance analysis. The categorical variables compared with Chi-square test. P value< 0.05 was accepted as statistically significant.

RESULTS

Before and after surgery, all patients had a level of >5 ng/L hs-cTnT concentration. Before operation Group G had a mean of 15.90±4.24 ng/L (95% CI, 7, 43-18, 52) and Group S had 12, 42±5, 01 ng/L hs-cTnT(95% CI, 8.13-19.27). (p=0.090). On postoperative day 1, Group G patients had a mean hs-cTnT 13.25±1.941 ng/L (95% CI, 10.43-18.22) and Group S patients had a hs-cTnT 10, 89±1.19 ng/L (95% CI, 7.83-19.429. (p=0.45) On postoperative second and third days Group G had a mean 12.56± 2.59 ng/L (95% CI, 5.83-21.22) and 13.09±4.32 ng/L (95% CI, 11.37-23.12), and Group S had mean 11.32±4.04 ng/L (95% CI, 9.63-19.52) and 19.34±3.2 ng/L (95% CI, 17.43-25.52; p=0.05), (p=0.40 and 0.05) respectively. The distribution of these values are shown in Table 2.

We didn't observe any cardiac complain and complication during the postoperative days. All the patients had a detectable hs-cTnT concentration before and after surgery. In Group S, we detected a near significant increase in hs- cTnT on postoperative third day and but patients didn't have any cardiac complication. As this finding is well consentient with other studies we think it needs attention to study on.

DISCUSSION

Nearly 50 million/year patients undergoing noncardiac operations is aged and it is likely that the number will double within years. Operations were done in an expense of cardiac mortality and morbidity, longer hospitalizations and increased cost, etc. About one million patients suffer from fatal and nonfatal perioperative cardiovascular complications annually (17). Ischemic events may occur due to postoperative pain, decreased capacity of O_2 carrying, acute reduction of cardiac output or blood pressure, intraoperative and postoperative bleeding, increased metabolic response to increased body temperature and shivering in operations. Especially in SSA myocardial tissue is more prone to ischemic events because of adrenergic hyperactivity and poor pain control. A large proportion of perioperative myocardial ischemia goes silent and undiagnosed and is left without adequate therapy. To prevent these ischemic events guidelines recommend a good preoperative cardiac risk assessment and propose the use of volatile anesthetics as beneficial although there is not enough evidence in high risk patients undergoing noncardiac surgery (class IIa

recommendation) (18). A systematic review failed to retrieve studies and a small trial published in the meantime did not detect any protective effect of volatile anesthetics on cardiovascular end points in noncardiac surgical patients. In addition the number of studies evaluating effects of spinal anesthesia are scarce. One of these studies compared selective spinal anesthesia with general anesthesia techniques and did not find any significant difference regarding arrhythmia and hemodynamic parameters (19). Another study assessed the effects of anesthesia techniques on myocardial ischemia and reported that anesthesia techniques did not affect serum CK-MB and Troponin I levels and ST segment levels on holter ECG monitorization in elderly patients undergoing urological operations (20). A few studies showed that perioperative cardiac Troponin is more effective than ECG, echocardiography, and other cardiac enzymes in diagnosing myocardial ischemia. Hs-cTn are more sensitive to myocardial injury than the other enzymes, even a small amount of myocardial damage can be detected with them.

We hypothesized to detect the ischemic event with studying the hs- Tn' s and expose undiagnosed cardiac complications. To our best knowladge, this is the first study comparing cardiac complications of spinal and general anesthetic methods with studying hs- cTnTin the literature. In the present study we didn't observed any elevated enzyme level and any ischemic event. This can be due to that our study group consisted of low risk patients and were treated with low risk operations. High risk patients and urgent operations were excluded from our study group according to our study protocol. Because most operations are done in urgent terms in the elderly, low risk patient population is one of the limitation of our study. Second limitation is that data during hospitalization and follow up period is absent. Although the near significant increase in cardiac enzyme level in SSA group correlates with guidelines recommendations we couldn't explain this because our group was small and long term follow up data were absent.

In conclusion, our study showed that elective low risk surgical operations in aged patients are quite safe in our country. Our finding make us to think SSA can be hazardous for myocardial tissue in the elderly patients. We need further confirmatory studies in deciding the safer anesthetic method in the geriatric population.

Conflict of interest

The authors have no financial disclosures to declare, no conflicts of interest to report, and no commercial or proprietary interest. There was no funding.

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- Ahmet KARAKEÇİ[1]
- Ahmet KELEŞ[2]
- Tunc OZAN[1]
- Fatih FIRDOLAŞ[1]
- Rahmi ONUR[3]

CORRESPONDANCE
Ahmet KARAKEÇİ
Fırat University, Department of Urology, Elazığ Turkey.

Phone: +904242333555
e-mail: akarakeci@firat.edu.tr

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[1] Fırat University, Department of Urology, Elazığ, Turkey.
[2] Esenyurt State Hospital, Department of Urology, Istanbul, Turkey.
[3] Marmara University, Pendik Training and Research Hospital, Department of Urology, Istanbul, Turkey.

RESEARCH

EFFICACY AND SAFETY OF BOTULINUM NEUROTOXIN IN GERIATRIC PATIENTS WITH AN OVERACTIVE BLADDER: A MULTICENTRIC STUDY FROM TURKEY

Abstract

Introduction: To evaluate the clinical efficacy and safety of botulinum neurotoxin A injection in geriatric patients with an overactive bladder.

Materials and Method: Data of 34 patients aged >65 years who received botulinum neurotoxin A injections (100 U) for overactive bladder at two different urology clinics from 2012 to 2018were retrospectively evaluated. Number of incontinence episodes, urinary frequency, nocturia occurrence, daily pad usage, maximum flow rate, post-void residual urine volume, treatment benefit scale and quality of life scores were evaluated for all patients at pre-treatment and then at 3 and 6 months post treatment.

Results: Comparison of the pre-treatment and the 3- and 6-month post-treatment data revealedno significant changes in maximum flow rate values (p=0.504 and 0.458, respectively); however, a statistically significant decrease was recorded in the urinary frequency, nocturia occurrence, daily pad usage and number of incontinence episodes (p=0.0001). The post-void residual urine volume significantly increased at 3 and 6 months post treatment (p=0.0001). Significant improvements were detected in the quality of life score at 3-months post treatment (p=0.0001).

Conclusion: Botulinum neurotoxin A injection is an efficacious and safe option for treating geriatric patients and improving their symptoms of overactive bladder and quality of life.

Keywords: Urinary Bladder, Overactive; Botulinum Toxin, Type A; Quality of life; Aged; Geriatrics

ARAŞTIRMA

AŞIRI AKTİF MESANESİ OLAN GERİATRİ YAŞ GRUBUNDAKİ HASTALARDA BOTULINUM NEUROTOXIN A ENJEKSİYONUNUN KLİNİK ETKİNLİĞİ VE GÜVENİLİRLİĞİ: TÜRKİYE'DEN ÇOK MERKEZLİ ÇALIŞMA

Öz

Giriş: Aşırı aktif mesanesi olan geriatrik hastalarda botulinum neurotoxin A enjeksiyonunun klinik etkinliğini ve güvenilirliğini değerlendirmek.

Gereç ve Yöntem: 2012-2018 yılları arasında iki farklı üroloji kliniğinde aşırı aktif mesane nedeni ile botulinum nörotoksin A enjeksiyonu (100 Ü) yapılan 65 yaş ve üstündeki 34 hastanın verileri geriye dönük olarak değerlendirildi. Tedavi öncesi ve tedavi sonrası 3. ve 6. Aydaki inkontinans ataklarının sayısı, idrar sıklığı, nokturia oluşumu, günlük ped kullanımı, maksimum akış hızı, sonrasındaki rezidüel idrar hacmi, tedavi yarar ölçeği ve yaşam kalitesi skorları değerlendirildi.

Bulgular: Tedavi öncesi ve tedavi sonrası 3 ve 6. aydaki verilerin karşılaştırılması, maksimum idrar akış hızı değerinde anlamlı bir değişiklik olmadığını ortaya koyarken (sırasıyla, p=0.504 ve 0.458); idrar sıklığı, nokturia oluşumu, günlük ped kullanımı ve idrar kaçırma ataklarının sayısında ise istatistiksel olarak anlamlı bir azalma kaydedildi (p=0.0001). Rezidüel idrar hacmi, tedaviden sonraki 3.ve 6 ayda önemli ölçüde artmıştır (p=0.0001). Tedavi sonrası 3. Aydaki yaşam kalitesi skorunda ise anlamlı iyileşmeler tespit edildi (p=0.0001).

Sonuç: Botulinum neurotoxin A enjeksiyonu, aşırı aktif mesaneli geriatrik hastaların tedavisinde, semptomların ve yaşam kalitesinin düzeltilmesinde etkili ve güvenli bir seçenektir.

Anahtar sözcükler: Mesane, Aşırı Aktif; Botulinum Toksin, Tip A; Yaşam kalitesi; Yaşlı; Geriatri

INTRODUCTION

The International Continence Society defines overactive bladder (OAB) as a complex of symptoms characterized by a sudden urge to urinate, with or without urge incontinence, usually with a high frequency and nocturiain the absence of an underlying pathology (1). Over 500 million individuals world wide experience OAB symptoms (2). The prevalence of OAB is approximately 16% in adults and increases with age, reaching up to 30% in geriatric patients aged >65 years (2). Overactive bladder symptoms lead to a feeling of embarrassment in social life and result in limitations in daily activities as well as cause sleep disorders, depression, anxiety and unfavorable sexual health-related effects (3,4). Moreover, frequent urination and urinary incontinence may be associated with fractures and may lead to mortality owing to falls on the way to the toilet (5).Considering the neural degeneration in the central nervous system, purinergic mechanisms and alterations in the response of muscarinic receptors are reportedly increasing the prevalence of OAB in geriatric patients (6).

Behavioral therapies, such as bladder re-training, changing the time and nature of liquid consumption, timed micturition and pelvic floor rehabilitation, are the first-line treatment options for OAB symptoms. However, first-line therapies are difficult to continue in geriatric patients; further, there are no supervised treatment centers for the proper guidance of patients (6). Thus, most patients discontinue treatment and show insufficient response to behavioral therapies. Second-line treatment options include oral medications with anti-muscarinic and/or beta-3 agonist agents. Although these agents exhibit a significantly better response than placebo, they induce insufficient efficacy and side-effects in geriatric patients, usually leading to the discontinuation of therapy in >50% of the patients by the 3rd month of treatment (6). Likewise, the use of medication in these patients is sometimes limited owing to the possibility of unfavorable side-effects on the cardiovascular and gastrointestinal systems as well as on cognitive functions (7).

In case the second-line treatment fails or cannot be tolerated due to side-effects, botulinum neurotoxin A (BoNTA) injection is considered the third-line treatment. Botulinum toxin reduces the expression of sensory receptors by targeting both the afferent and efferent neuronal pathways in the bladder and preventing the release of acetylcholine and other neurotransmitters. Because BoNTA does not interact with the muscarinic and/or beta 3 receptors, it does not induce any unfavourable effects on cognitive functions (6). Studies have reported satisfactory results regarding this treatment modality. The U.S. Food and Drug Administration approved BoNTA as a treatment modality for neurogenic bladder and OABin 2011 and 2013, respectively (8). Few previous studies have also confirmed the efficacy and safety of BoNTA in geriatric patients (6-9,10).

Currently, there are no suitable data on the use of BoNTA injection for OAB treatment in geriatric patients; moreover, to the best of our knowledge, no such experience has been reported in our country. Therefore, we aimed to retrospectively evaluate the clinical efficacy and safety of BoNTA injection in geriatric patients aged ≥65 years with OAB.

MATERIAL AND METHOD

Study group

Data of 40 patients aged >65 years who received botulinum neurotoxin A injections (100 U) for overactive bladder at two different urology clinics from 2012 to 2018were retrospectively evaluated Ethical Committee approval was obtained (06.09.2018/14/6), and the patients were informed about the injection method and the possible complications, such as urinary infection and retention. Written informed consent was obtained from all patients. All patients underwent detailed physical and urogynaecological examinations, and

laboratory tests, including urine analysis, culture and voiding diary for at least 3 days, uroflowmetry, post-micturition residual urine measurement, urodynamic and urinary system ultrasound, were performed. Patients with urinary infection were treated according to their urine culture results. Those with ≥1 urinary incontinence episodes per day, those who urinated >8 times per day and experienced ≥1 episode of nocturia per day according to the voiding diaries as well as those who were treated with two different anti-muscarinic and/or beta-3 agonists for a time period of ≥3 months and who did not respond to the treatment or had to quit the treatment due to side-effects were included in the study. Patients with urgency and/or urge incontinence due to neurological disorders, history of prior urinary BoNTA injection, previous pelvic surgery, stress-dominant urinary incontinence, bleeding tendency, bladder outlet obstruction (Benign prostatic hyperplasia, urethral stricture etc.) or a contractile bladder according to the urodynamic evaluation, muscular diseases (such as myasthenia gravis) and muscular dystrophies were excluded from the study.

Surgical technique

All patients received prophylactic antibiotic treatment one day before the operation, on the day of the operation and for 3 days postoperation. Under sedo analgesia and using a 20-F rigid cystoscope (Karl Storz; Tuttlingen, Germany), 100 U of BoNTA (BOTOX®, Allergan, Irvine, CA, USA) was diluted with10 mL saline and then injected into the detrusor muscles at 20 sites, excluding the trigone and bladder dome (0.5 mL for each injection). No urethral catheter was placed postoperation.

Outcome analysis

Post-void residual (PVR) volume >200 mL or the inability to void after the procedure was accepted as urinary retention, and a positive urine culture (>105colonies mL/U) with positive urine analysis (>5 leucocytes/HPF) was considered as urinary infection. At least one hour after termination of these do analgesia procedure and the patient was fully conscious, feeling uncomfortable due to the pain, burning, stinging sensation etc. in the pelvic area was also accepted pain at the injection site. Postoperative analgesia requirement of our patients was determined by examining medical records retrospectively. Complications, such as urinary infection, dysuria, urinary retention, haematuria, muscle weakness and pain at the injection site which may occur postoperation, were recorded.

To determine the success of the intervention, the patients were asked to fill the treatment benefit scale (TBS) form after 3and 6monthsof the injection treatment (11). The patients were asked to describe the treatment result as improved, quite improved, not changed or worsened. The answers quite improved and improved indicated surgical success. To evaluate the patients' quality of life (QoL) related to health affected due to OAB symptoms, the Turkish validated version of the incontinence QoL (I-QoL) scale comprising three groups, which is a measurement for the limitation of the mental and social life, was applied at pre-treatment and then at 3 and 6monthspost treatment (12,13). Incontinence episodes, frequency, nocturia status, daily pad usage, maximum flow rate (Qmax) and PVR volume were recorded pre-treatment and then at 3 and 6 months post treatment.

Statistical analysis

The Statistical Package for Social Sciences (SPSS Inc. V20.0; Chicago, IL, USA) for Windows was used for statistical analyses. Mann–Whitney U-test was used to compare the continuous variables, and Chi-square or Fisher's exact test was used to compare the categorical variables. The results were analysed within a 95% confidence interval, and $p<0.05$ was regarded statistically significant.

RESULTS

Of the 40 patients that complied with the inclusion criteria, 6 were excluded due to various reasons (inability to follow up instructions or not answering

all questions). Thirty four patients patients, 17 (50%) were women and 17 (50%) were men. The mean patient age was 72.3±5.9 (range,65–85) years. The mean incontinence duration was 9.8±3.8 years. Additional comorbidities were observed in the majority of the patients. The demographic characteristics of the study population are shown in Table 1. On comparing the pre-treatment data with the3- and 6-month post-treatment duration, a statistically significant decrease was recorded in the frequency, nocturia, daily pad usage and incontinence episodes. An approximately 3-fold decrease was noted, particularly in terms of incontinence and the daily pad usage. The voiding diary after treatment is presented in Table 2.

There was no significant change in the Qmax valuesat3 and 6monthspost treatment when compared with that at pre-treatment (11.8±3.2, 11.2±3.5/s and 11.6±3.4 mL/s, respectively; p=0.504 and0.458, respectively). When compared with that at pre-treatment, the PVR values were significantly increased at 3 and 6 months after injection (102.0±55.4, 90.0±58.3and67.5±22.2mL, respectively; p=0.0001).

I-QoL scores of patients before the procedure were less compatible with the severity of symptoms; however, significant improvements detected at 3months post treatment (44.0±4.6 and 69.2±11.9, respectively; p=0.0001) (Figure 1). TBS score at 3months post treatment revealed a satisfaction rate of 70.6%.At 6monthsposttreatment, the I-QoL score showed a slight decrease, although it was still high as compared with that at pre-treatment, and treatment satisfaction according to TBS was 55.9% (Figure 1; Table 3).

Gross haematuria in 2 women and 1 man, urinary tract infection in 4 women and 1 man and high PVR (in 5 men and 1 woman)were detected after injection. While patients with urinary tract infection were treated with an appropriate antibiotic treatment, those with haematuria were conservatively treated thorough adequate hydration and parenteral fluid therapy without urinary catheterization and were

Table 1. The socio-demographic characteristics of the patients.

Variable	Mean
Age±sd (mean)	72.3±5.9 (65-85)
Duration of disease (±sd)	9.8±3.8 (2-15) year
Duration of using drug (±sd)	3.9±1.42 (1-5) years
Gender, n (%)	
Women	17 (50%)
Men	17 (50%)
Weight±sd (mean)	72±8.1 (57-100) kg
Height±sd (mean)	165.6±5.9 (150-180) cm
BMI±sd (mean)	26.4±3.2 (20-41.6) (kg/m^2)
Using tobacoo, n (%)	
Yes	9 (26.5%)
No	25 (73.5%)
Education level, n (%)	
Primary school	21 (61.7%)
Middle school	11 (32.3%)
High school	2 (6%)
University	0 (0%)
Comorbidity, n (%)	
No	10 (29.4%)
HT	7 (20.5%)
CAD	3 (8.9%)
DM	9 (26.5%)
Others	5 (14.7%)

BMI: Body Mass Index **HT:** Hypertension **CAD:** Coronary Artery Disease **DM:** Diabetes Mellitus

Table 2. Change from baseline in daily average episodes and total I-QOL scores.

	Min.-Max	Median	Mean±sd	p
I-QOL scores				
Preop	35.0- 50.0	45.0	44.0 ± 4.6	
Postop 3rd month	45.0 - 81.0	73.5	69.2 ± 11.9	**0.0001***
Postop 6th month	40.0 - 80.0	70.0	66.1 ± 10.5	**0.0001****
Daily pad usage± sd				
Preop	0.0 - 5.0	2.0	2.0 ± 1.8	
Postop 3rd month	0.0 - 3.0	0.0	0.5 ± 0.9	**0.0001***
Postop 6th month	0.0 - 3.0	0.0	0.6 ± 1.0	**0.0001****
Mean urinary frequency±sd				
Preop	8.0 - 18.0	14.5	14.1 ± 1.9	
Postop 3rd month	0.0 - 14.0	8.0	8.4 ± 2.3	**0.0001***
Postop 6th month	7.0 - 14.0	9.5	9.4 ± 1.5	**0.0001****
Mean nocturia episodes±sd				
Preop	2.0 - 5.0	4.0	3.6 ± 0.9	
Postop 3rd month	0.0 - 4.0	1.0	1.5 ± 0.9	**0.0001***
Postop 6th month	1.0 - 4.0	1.5	1.7 ± 0.9	**0.0001****
Mean UI episodes±sd				
Preop	0.0 - 10.0	3.0	3.5 ± 2.9	
Postop 3rd month	0.0 - 5.0	0.0	0.9 ± 1.5	**0.0001***
Postop 6th month	0.0 - 5.0	1.0	1.3 ± 1.6	**0.0001****
Q max±SD (mL/s)				
Preop	9.0 - 17.0	12.0	11.8 ± 3.2	
Postop 3rd month	5.0 - 16.0	11.0	11.2 ± 3.5	**0.4582***
Postop 6th month	6.0 - 17.0	12.0	11.6 ± 3.4	**0.5041****

Mean±SD: Mean±standard deviation, **Min:** Minimum, **Max:** Maximum, **Preop:** Preoperative, **Postop:** Postoperative **I-QOL:** Incontinence quality of life **UI:** Urinary incontinence **PVR:** Post-void residual **Q max:** Maximum flow rate **p*:** Comparison of Preop and post op. 3rd month **p**:** Comparison of Preop and post op. 6th month p **< 0.05:** Statistically significant value.

discharged after the haematuria are solved. Clean intermittent catheterization (CIC) was required in 6 patients for 4 weeks due to their high residual volume; no continuous retention was noted. Since none of the patients has described any pain in the injection area, no analgesics was required in any of our patients. Table 4presents the post-procedural outcomes and complications of the study.

Table 3. Postoperative treatment benefit scale results.

		n=34(%)
TBS at 3rd month (%)	Well improved	11 (32.4)
	improved	13 (38.2)
	No change	7 (20.6)
	worse	3 (8.8)
TBS at 6th month (%)		
	Well improved	9 (26.5)
	Improved	10 (29.4)
	No change	10 (29.4)
	worse	5 (14.7)

Table 4. Postoperative results and complications of patients.

	n=34(%)
Duration of operation (minute)	12.5
Urinary infection (%)	5 (14.7)
Urine retention (%)	6 (17.6)
Dysuria (%)	-(-)
Hematuria (%)	3 (8.8)
Muscle weakness (%)	-(-)
Pain at the injection site (%)	-(-)

TBS: Treatment benefit scale

DISCUSSION

This study is the first to evaluate the efficacy and safety of BoNTA injection in Turkish geriatric patients aged >65 years with OAB who did not respond to previous therapies. Our results reveal both statistically and clinically significant improvements in all OAB symptoms after the administration of 100 U of BoNTA injection. Likewise, TBS and QoL assessments revealed improved patient perception and procedural success.

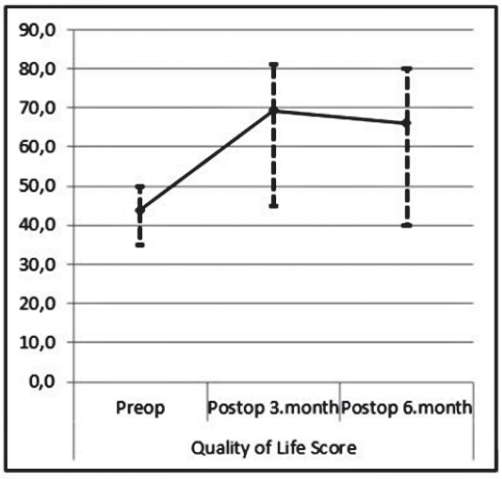
It has recently been reported that the efficacy of BoNTA injection is similar in young and geriatric patients. In comparison with that before injection, Liao et al. detected a significant decrease in the urgency episodes after the administration of 100 U BoNTA (16.3±18.2 vs. 11.7±31.4) (9). In his study evaluating geriatric patients aged >75 years, White et al. reported a decrease in the daily pad usage due to incontinence after 200 U of BoNTA injection at 1 and 6 months post treatment (4.0±0.89, 1.3±0.60, and 2.81±0.75 respectively). They also reported a significant decrease in the frequency as compared with that at pre-treatment (11.44±1.67, 5.19±0.83 and 7.44±1.67 respectively) (10). In our study, improvement in the mean frequency, nocturia, daily pad usage and incontinence episodes at 3 and 6 months after injection corroborated with that reported in the literature.

White et al. reported TBS of >50% in 76% of the patients within 1 month of treatment in their study on OAB in geriatric patients (10). Similarly, Liao et al. reported significant clinical improvement after the administration of 100U of BoNTA injection in the number of incontinence and QoL of three different patient groups with OAB who were aged <65 years, >65 years and in frail geriatrics (9).

In accordance with the literature, we noted improvement in QoL at 3 and 6 months post treatment. Although there were slight decreases in the scores at 6months, the results achieved were significant. TBS was corroborated with QoL. Moreover, 70.6% and 55.9%of the patients described their health status as quite improved and improved at 3 and 6 months post treatment, respectively.

Urinary retention and urinary tract infection are the most common complications of BoNTA injections; other adverse effects include haematuria, dysuria and pain at the injection site. In prior studies, such unfavourable complications were reported in approximately 20%–43%of all patients (14). In meta-analyses of side-effects after injection in patients aged >60 years, urinary infection was found to occur

Figure 1. Results of "Incontinence Quality of Life" scores.



in 10.3%–15.4% of the patients (10, 15). Jiang et al. reported that the incidence of urinary tract infection after injection is closely associated with female sex and baseline residual urine volume of >100 mL. However, they also reported no correlation between increased age and urinary tract infection occurrence. (15). In our study, urinary infection was detected in 5 patients (14.7%), all of whom were treated with antibiotics according to their urine culture results.

A residual urine volume of >200 mL after injection is described as urinary retention (16). A meta-analysis revealed a significant residual urine volume and CIC requirement after 100U of toxin injection as compared with placebo (17). Jiang et al. stated that higher rates of urinary retention in patients aged >60 years were associated with male sex, presence of comorbidities (e.g. frailty), initial maximum urinary flow rate <15and residual urine volume>100 mL. (15). Jiang et al. reported that the rates of patients with PVR >200 mL after the administration of 100 U of BoNTA injection were 35.6% in patients aged 60–75 and 29% in those aged >75 years (15). In another study, the rates of patients with PVR >250 mL after the administration of 100U of BoNTA injection were 60.7% in invalid geriatric patients and 39.7% in geriatric patients without any disability (9). In our study, we found lower PVR volumes, which may be attributed to the presence of female patients constituting 50% of the patient group, the absence of invalid and depending patients and to the fact that the mean pre-treatment PVR volume was <100 mL.

Our study has several limitations, including its retrospective design, short duration of follow-up, lack of placebo control and the small sample size. However, it also has several strengths; the main strength was that therapeutic success was based on patient satisfaction and that a standardized diagnostic and follow-up protocol could be implemented for all patients owing to the multicentre design of the study.

This study is the first Turkish multicentre study that evaluated geriatric patients aged >65 years. Our results indicate that 100 U of BoNTA injection is efficacious and safe for the treatment of geriatric patients and for improving their OAB symptoms and QoL. However, large series, placebo controlled and long follow-up studies are needed.

Conflict of interest

None.

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RESEARCH

ANALYSIS OF BILATERAL FEMORAL GEOMETRIC PARAMETERS IN 16 PATIENTS WITH ATYPICAL FEMORAL FRACTURES

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■ Ramadan ÖZMANEVRA[1]
■ Barış POLAT[1]
■ Deniz AYDIN[2]

Abstract

Introduction: This study aimed to investigate the associationbetween femoralgeometry and clinical features and to analyse the effect of bisphosphonate use on atypical femur fracture healing.

Materials and Method: Patients admitted with femoral shaft fractures were examined,and thosewhofulfilled the diagnostic criteria for atypical fractures according to the 2014-revised edition of the American Society for Bone and Mineral Research(ASBMR) were included in this study. Fracture localisation, inner and outer cortical thickness, lateral bowing and femur neck-shaft angle of both fractured and contralateral sides were measured. We analysed the correlations between demographics, clinical factors and radiographic features.

Results: Our study group comprised 14 females and 2 males. The mean age was 76.3 (range, 67–91) years. The mean follow-up period was 45.9 (range, 12–84) months. All the fractures were located on the femoral shaft. The mean duration of fracture union was 8 (range, 4–11) months. The outer cortical thickness of the fractured side was significantly greaterthan that of the contralateral side. No significant difference was observed between the inner corticalthickness of the fractured and contralateral sides. The lateral bowing of the fractured femoral shaft was significantly greater than that of the contralateral femur. A significant positive correlation was observed between the duration of bisphosphonate use and both fracture healing time and lateral bowing of the femoral shaft.

Conclusion: Long-term bisphosphonate usealtersthe femoralgeometry not only on the fractured side but also on the contralateral side and increases the fracture risk.

Keywords: Femoral fractures; Osteoporosis; Alendronate; Diphosphonates

CORRESPONDANCE
Ramadan ÖZMANEVRA
University of Kyrenia, Northern Cyprus, Orthopaedics and Traumatology, Girne, TRNC.

Mobile: +905338635167
e-mail: rozmanevra@gmail.com

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[1] University of Kyrenia, Northern Cyprus, Orthopaedics and Traumatology, Girne, TRNC.
[2] Near East University, Orthopaedics and Traumatology, Lefkoşa, TRNC.

ARAŞTIRMA

ATİPİK FEMUR KIRIĞI OLAN 16 HASTANIN HER İKİ TARAF FEMURLARININ GEOMETRİK PARAMETRELERİNİN DEĞERLENDİRİLMESİ

Öz

Giriş: Bu çalışmada femur geometrisi ile klinik özellikler arasındaki ilişkiyi araştırmak ve bifosfonat kullanımınına tipik femur kırığı iyileşmesi üzerindeki etkisini analiz etmek amaçlanmıştır.

Gereç ve Yöntem: Femoral şaft kırığı ile başvuran hastalar analiz edildi ve Amerikan Kemik ve Mineral Araştırmaları Derneği (ASBMR)'nin 2014'te revise edilmiş baskısına gore atipik kırıklar için tanı kriterlerini karşılayan hastalar çalışmaya dahil edildi. Kırık lokalizasyonu, iç ve dış korteksin kalınlığı, lateral eğilme ve hem kırık hem de karşı tarafların femur boyun-cisim açıları ölçüldü. Demografik, klinik faktörler ve radyografik özellikler arasındaki korelasyonlar analiz edildi.

Bulgular: Çalışma grubumuz 14 kadın ve 2 erkekten oluşmaktadır. Ortalama yaş 76.3 (dağılım, 67–91) idi. Ortalama takip süresi 45.9 (dağılım, 12-84) aydı. Tüm kırıklar femur şaftı üzerinde idi. Ortalama kaynama süresi 8 (4-11) ay idi. Kırık tarafın dış korteksin kalınlığı kontralateral taraftan anlamlı derecede yüksekti. Kırık tarafın iç korteksinin kalınlığı kontralateral taraftan anlamlı derecede farklı değildi. Kırık femur şaftının lateral eğimi, kontralateral femurdan anlamlı derecede yüksekti. Bisfosfonat kullanım süresi ile hem kırık kaynama süresi hem de femur şaftının lateral eğilmesi arasında anlamlı bir pozitif korelasyon gözlendi.

Sonuç: Uzun vadeli BFS kullanımı femur geometrisini sadece kırık tarafında değil kontralateral tarafta da değiştirir ve kırılma riskini arttırır.

Anahtar sözcükler: Femur kırıkları; Osteoporoz; Alendronat; Bifosfonat

INTRODUCTION

Osteoporosis is a skeletal disorder characterised by low bone density resulting inmicrostructure disorders that can increase fracture susceptibility (1). Osteoporosis has a higher prevalence among older adults. Notably, treatment of osteoporosis-related fractures can be expensive (2). Bisphosphonates (BPs) are widely used as therapy to efficiently treat and prevent fractures in patients with osteoporosis. Furthermore, they are often used as the first line of treatment for osteoporosisaccording to the current evidence-based guidelines (3). Moreover, BPsare used in the treatment of Paget's disease, metastatic bone disease and multiple myeloma.

Several large clinical trials have revealed the reliability and tolerability of BPs (4). However, post-marketing reports and epidemiological studies have reported some rare and potentially graveadverse effects associated with the long-term BPuse, such as dyspepsia, nausea, muscular pain, osteonecrosis of the jaw and atrial fibrillation (5). Becauseof theadverse effectsof BPs,despite the primary use of BPs to prevent osteoporosis-related fractures, a paradoxicalassociationbetween BPs and atypical femoral fractures (AFFs) was first demonstrated in 2008 (6). Several reports have suggested a possible association between BP use and AFFs (7-12).

The American Society for Bone and Mineral Research (ASBMR) defined the diagnostic criteria for AFFs in 2010 (13), and this has recently garnered interest. In 2014, the updated diagnostic criteria were published. AFF is diagnosed based on subtrochanteric or femoral shaft location and the presence of at least the following four or five major criteria: minimal trauma, fracture originating at the lateral cortex and being substantially transverse, complete fractures extending through both cortices, localised periosteal or endosteal cortical thickening and minimal comminution. Diagnosis excludes minor criteria; however, it includesincreased cortical thickness of the femoral diaphysis, bilaterality, a prodrome of thigh or groin pain and delayed fracture healing (14).

Few studies have investigated the association between AFFs and femoral geometry. Jang et al. reported the association between bowing and cortical thickness (15). A study by Starr et al. concluded that a decrease in the femoral neck-shaft angle and an increase in lateral bowing increased the risk of AFF because of the tensile stress applied to the lateral femoral cortex (16).

Therefore, our study included both clinical features and radiological measurements, including femoralgeometry. This study aimed to investigate

Figure 1. BP-related fracture of the femur shaft.

Figure 2. Measurement of femur neck-shaft angle.

Figure 3. Method of lateral bowing measurement.

Figure 4. Lateral cortical thickness.

Table 1. Demographic features of the patients.

Variable		Min.-Max	Median	Mean±sd
Age		67.0-91.0	74.0	76.3±7.4
Gender	Female		14	87.5%
	Male		2	12.5%
Fracture location (Femur)	Shaft		16	100.0%
Operation type	IMN		12	75.0%
	Plate		4	25.0%
Type of Bisphosphonate	Alendronate		12	75.0%
	Risedronate		4	25.0%
Duration of Bisphosphonate use (Year)		4.0-12.0	7.0	7.1±2.3
Supplement	Ca		16	100.0%
	D-Vit		16	100.0%
Fracture healing time(months)		4.0-11.0	8.0	7.9±1.8

the association between femoralgeometry and clinical features, alongwiththe effect of BPs on fracture healing.

MATERIALS AND METHOD

Patients admitted to a Level 1 Trauma Centre between January 2012 and January 2018 with femoral shaft fractures were analysed, and those who fulfilled the diagnostic criteria for atypical fractures according to the 2014-revised edition of the ASBMR were included in this study. Exclusion criteria were femoral fractures following high-energy trauma, patients who had previously undergone femoral surgery, patients whose BPuse duration was <4 years and thosewith inadequate radiographs that did not permit measurements. In total, 16 patients were included in this study. The patients' medical records and radiographs (pelvis anteroposterior andbilateral femur anteroposterior views) were examined retrospectively. Demographic data were collected, including patients' age, gender, BP use duration, type of surgery performed and type of BP used.

Image analysis

Calculations were independently performed by two orthopaedic surgeons according to the ASBMR. Fracture localisation, inner and outer cortical thickness, lateral bowing and femoral neck-shaft angle of both the fractured and contralateral sides were measured (Figures 1-4).

The femoral neck-shaft angle was calculated and classifiedinto three groups: normal (between 125°–140°), coxa valga (>140°) and coxa vara (<125°). The femoral bowing angle was described as the angulation between the proximal and distal quarters of the femoral diaphysis. We analysed the associations between demographics, clinical factors and radiographic features.

Table 2. Measurements by the two orthopaedic surgeons.

	1st Orthopaedic surgeon		2nd Orthopaedic surgeon		p^w	r (%95 Confidence Interval)	p^{IC}
	mean±sd	median	mean±sd	median			
Cortical thickness							
Fractured side(outer)	6.7±1.3	7.0	6.7± 1.3	6.9	0.083	0.998 0.995 - 0.999	**0.000**
Fractured side (inner)	5.7±1.3	5.7	5.7±1.3	5.7	0.285	0.997 0.993 - 0.999	**0.000**
Contralateral side (outer)	5.7±0.8	6.0	5.7±0.8	6.0	0.083	0.996 0.987 - 0.999	**0.000**
Contralateral side (inner)	5.9±1.7	5.3	5.8±1.7	5.3	0.083	0.998 0.995 - 0.999	**0.000**
Femur neck-shaft angle							
Fractured side	123.7±8.0	121.5	123.7±8.0	121.8	1.000	0.995 0.985 - 0.998	**0.000**
Contralateral side	127.8±5.6	127.0	127.8±5.2	127.3	0.873	0.995 0.985 - 0.998	**0.000**
Lateral bowing							
Fractured side	6.7±3.2	6.5	6.7±3.2	6.4	0.282	0.999 0.996 - 1.000	**0.000**
Contralateral side	6.0±2.7	6.0	6.0±2.7	6.1	0.475	0.999 0.998 - 1.000	**0.000**
Nail diameter	11.8±1.2	12.0	11.8±1.2	12.0	1.000	1.000 1.000 - 1.000	**0.000**
Medulla diameter	15.1±3.0	14.5	15.1±2.8	14.4	0.822	0.993 0.975 - 0.998	**0.000**

p^w Wilcoxon test / **p^{IC}** Intraclass Correlation

Statistical analysis

The mean, standard deviation, median lowest, highest, frequency and ratio values of the descriptive statistics were used. The distribution of the variables was measured using the Kolmogorov–Smirnov test. The Wilcoxon test was used to analyse dependent quantitative data. Correlation was analysed using the intra-class correlation analysis. The statistical analysis was performed using the SPSS 22.0 programme.

Ethical approval

The study was approved by the Ethics Committee of the University of Kyrenia (Northern Cyprus) (RY-2018-28).

RESULTS

Our study group comprised 14 females and 2 males. The mean age was 76.3 (range, 67–91) years. The mean follow-up period was 45.9 (range, 12–84) months. All the fractures were located on the femoral shaft. Twelve of these fractures were treated using anintramedullary nail (IMN), and the other fourwere treated using plate fixation.

In one of the IMN surgeries, the distal one-third ofthe femoral shaft was fractured; however, the surgerywas completed by pushing the nail forwards and distal to the iatrogenic fracture line withoutadditionalintervention.

Twelve and four patients were using alendronate and risedronate, respectively. The BP useduration ranged from a minimum of 4 to a maximum of 12 years. All patients used calcium and vitamin D supplementation.

The mean duration of fracture union was 8 (range, 4–11) months (Table 1). The coxa vara was present in nine patients, whereasseven patients had a normal femoral neck-shaft angle. On the contralateral side, eight coxa vara and eight normal hips were detected.

Furthermore, no significant difference was observed between the measurements conducted by the two orthopaedic surgeons, and a significant correlation was observed (Table 2).

The outer cortical thickness of the fractured side was significantly higher than that of the contralateral side ($p<0.05$) (Figure 5). No significant difference was observed between the inner corticalthickness of the fractured and contralateral sides ($p>0.05$). The lateral bowing of the fractured femoral shaft was significantly greaterthan that of the contralateral femur ($p<0.05$) (Table3). A significant ($p<0.05$) positive correlation was observed between fracture healing time and BP useduration (Table 4). Furthermore,a significant ($p<0.05$) positive correlation was observed between the lateral bowing of the fracture side shaft and BPuse duration.

DISCUSSION

Osteoporosis remains a health concern for the growing elderlypopulation.Long-term BPtherapy for treating patients with osteoporosis is associated with AFFs. An increasing number of reports have identified complete AFFsduring pre-and post-operative periods in patients using BPs (7-12). However, whetherBPs are the only cause of AFFs is yet unclear because some reports have identified AFFsthat are unrelated to BP use (17). AFFs have been frequently reported since 2005 (18), accounting for approximately 1% of all femoral fractures (19).

A study by Napoli et al. identified that women with thinner medial cortices were at a higher risk of subtrochanteric/diaphyseal femoral fracture. Moreover, they indicated that medial or total cortical thickness strongly correlated with fracture risk compared with the lateral cortical thickness (20). In our study, the outer corticalthickness of the fractured side was significantly greater than that of the contralateral side. However, no significant difference was observed between the inner cortical thickness of the fractured and contralateral sides.

Table 3. Comparison of the measurements between fractured and contralateral sides.

	Fractured side		2nd Orthopaedic surgeon		p^w
	mean±sd	median	mean±sd	median	
Cortical thickness-outer cortex	6.7±1.3	7.0	5.7±0.8	6.0	**0.011**
Cortical thickness-inner cortex	5.7±1.3	5.7	5.9±1.7	5.3	0.469
Femur neck-shaft angle	123.7±8.0	121.5	127.8±5.6	127.0	0.098
Lateral bowing of the femur	6.7±3.2	6.5	6.0±2.7	6.0	**0.028**

p^w Wilcoxon test

Our study observed coxa vara in 56% of fractured femurs and 50% of contralateral femurs on analysis ofBP-related anatomical changes. However, increased femoral lateral bowing was observed in all patients, and the degree of lateral bowing was positively correlated with BP use duration. Thecomputed tomography (CT)-based nonlinear finite element analysis results in the literature revealed that decreased femoral neck-shaft angle and increased lateral bowing can increase the tensile stress over the subtrochanteric area and femoral shaft, respectively (21). We believe that the increased stress results inthe thickening of the lateral femoral cortex and that the continuous load results in fatigue fractures. Furthermore, increased fragility may be associated with histological changes caused by long-term BP use.

Lloyd et al. examined bone tissue from women with AFFs and revealedthat long-term BP treatment degrades the fracture-resistance and strengthening mechanisms that are inherent to a healthy bone (22). The likely anatomical and histological changes inthe femur in a patient with long-term BP use should be considered perioperatively because of the iatrogenic fracture risk, particularly following IMN. Notably, we experienced an iatrogenic distal femoral fracture in one of our study patients treated with IMN.

We observedan increase in the outer corticalthickness and a decrease in the femoral neck-shaft angle in the bowing side. Coxa vara was detected in approximately half of the patients on both the fractured and contralateral sides. When the femoral neck-shaft angles were compared, no statistically significant difference was found between the fractured and contralateral sides. This finding may suggest that a decrease in the femoral neck-shaft angle in the contralateral femur may increase the fracture risk.

Narusel et al. investigated the effect of alendronate in a rat model and identified that alendronate did not prevent long bone fragility in an inactive rat model;they concluded that BP use may provide therapeutic benefit to individuals with osteoporosis whose daily activity is not limited (23). Most patients receiving BP therapy are elderly and have limited mobilisation. Therefore, Narusel et al. reported that long-term BP use in these patients may have a negative effect on long bone fragility (23). Notably, our study group consisted of inactive patients who were typically mobilised within their home.

However, when these fractures occur,prophylactic surgical treatment of the contralateralextremity is controversial. A recent study advocated that prophylactic surgical treatment is cost-effective in patients with more than one risk factor. The risk factors were determined to be Asian ethnicity, prodromal pain, coxa vara, femoral bowing, periosteal beaking and transverse radiolucent line (24). Furthermore, IMN, which is the gold standard forfemoral shaft fractures, is performed for AFFs. IMN is advantageous because it decreasesthe load on the lateral cortex compared with the plate fixation. Therefore, IMN is recommended by most authors. However, only 4 of 16 patients inour study groupunderwentplate fixation. Therefore, we could not adequately compare the results of plate fixation and IMN because ofthe inequality between the two groups.

The limitations of our study are its retrospective design, the small number of patients and the lack of bone densitometry and inactivity scores.

In conclusion, our study predicted that long-term BP use not only changes the femoralgeometry on the fractured side but also on the contralateral side and increases the fracture risk. Furthermore, we predicted that the delay in fracture union may be associated with BPuse duration and that the fracture union is affected by changes in the femoral geometry.

The increased intraoperative fracture risk and

delayed union of AFFs in the elderly, inactive and non-expressive patients with long-term BPusemust be considered to facilitate successful diagnosis and treatment.

Conflict of interest

All authors declare that there is no conflict of interest regarding this work.

Table 4. Correlation between measurements and demographic features.

Measurement parameter		Age	Duration of Bisphosphonate Use	Fracture Healing Time	Medulla-Nail thickness difference
Fracture healing time	**r**	0.491	0.549	-	0.084
	p	0.054	0.028	-	0.796
Medulla-Nail thickness difference	**r**	−0.342	−0.012	0.084	-
	p	0.277	0.969	0.796	-
Cortical thickness					
Fractured side-outer cortex	**r**	−0.084	−0.102	0.295	0.222
	p	0.756	0.707	0.268	0.488
Contralateral side-outer cortex	**r**	0.146	0.076	0.537	−0.374
	p	0.602	0.788	0.039	0.257
Fractured side-inner cortex	**r**	0.269	0.047	0.376	−0.251
	p	0.333	0.868	0.167	0.457
Contralateral side-inner cortex	**r**	0.116	−0.095	0.412	−0.544
	p	0.668	0.726	0.113	0.068
Femur neck-shaft angle					
Fractured side	**r**	−0.249	−0.273	−0.309	−0.207
	p	0.351	0.306	0.245	0.519
Contralateral side	**r**	0.028	0.188	−0.125	−0.274
	p	0.917	0.486	0.644	0.389
Lateral bowing of the femoral shaft					
Fractured side	**r**	0.467	0.509	0.377	0.309
	p	0.068	0.044	0.150	0.329
Contralateral side	**r**	0.393	0.386	0.299	0.405
	p	0.132	0.140	0.261	0.191

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RESEARCH

THE RELATIONSHIP BETWEEN ACUTE ARTERIAL OCCLUSIONS AND THE STAGE OF PERIPHERAL ARTERIAL DISEASE ACCORDING TO THE FONTAINE CLASSIFICATION

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İbrahim Murat ÖZGÜLER[1]
Latif ÜSTÜNEL[1]
Ayhan UYSAL[1]

CORRESPONDANCE
İbrahim Murat ÖZGÜLER
Fırat University Hospital, Cardiovascular Surgery, Elazığ, Turkey.

Phone: +904242333555
e-mail: drmuratozg@hotmail.com

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[1] Fırat University Hospital, Cardiovascular Surgery, Elazığ, Turkey.

Abstract

Introduction: Peripheral vascular disease is defined as narrowing of blood vessels that restricts blood flow. Atherosclerosis is the most common etiology followed by vasculitis, dysplastic syndromes, degenerative diseases, thrombosis, and thromboembolism. The mortality rate at diagnosis is 4%–6%. Atherosclerotic peripheral vascular disease and leg amputation from such condition increase the mortality rate to 30%, and the 5-year survival rate is less than 30%. Thus, disease severity and extent of peripheral vascular disease must be evaluated and presented.

Materials and Method: Between January 2005 and March 2018,98 patients underwent surgery for acute arterial occlusion owing to chronic peripheral arterial disease were evaluated according to the Fontaine Classification, demographic characteristics, concomitant disease, physical examination findings, type of surgery and amputation and mortality rates, and its causes were analyzed.

Results: None of the patients (n=98) presented with Fontaine stage I disease. Because peripheral arterial disease is usually observed in the elderly population, elderly patients with several health problems at advanced age are more likely to undergo extremity amputation. It can be reduced by including the ankle brachial index examination in any outpatient clinic. Other stages of the disease were also evaluated in detail.

Conclusion: ABI examination should be included in the systemic examination for patients aged>70 years. Currently, lumbar hernia, osteoporosis or osteoarthritis are also observed in such patients, and the clinical signs of peripheral arterial disease are masked. Due to these diseases, the diagnosis of peripheral arterial disease is delayed.

Keywords: Peripheral arterial disease; Ankle Brachial Index; Amputation

ARAŞTIRMA

AKUT ARTERİYEL TIKANIKLIKLAR VE PERİFERİK ARTER HASTALIĞININ FONTAİNE SINIFLAMASI'NA GÖRE EVRESİ ARASINDAKİ İLİŞKİ

Öz

Giriş: Periferik vasküler hastalık, kan akışını kısıtlayacak şekilde damarların daralması olarak tanımlanır. Ateroskleroz en sık görülen etiyolojik etken olup bunu vaskülit, displastik sendromlar, dejeneratif hastalıklar, tromboz ve tromboembolizm izlemektedir. Hastalığın mortalite oranı %4-6 arasındadır. Aterosklerotik periferik vasküler hastalıkta bacak amputasyonu mortalite oranını % 30'a yükseltir ve 5 yıllık sağkalım oranı da %30'dan azdır. Bu nedenle, hastalığın şiddeti ve periferikvasküler hastalığın kapsamı iyi değerlendirilmeli ve ortaya çıkarılmalıdır.

Gereç ve Yöntem: Ocak 2005-Mart 2018 tarihleri arasında periferik arter hastalığı nedeniyle akut arter tıkanıklığı nedeniyle tedavi gören 98 hasta Fontaine Sınıflandırması, demografik özellikler, eşlik eden hastalık, fizik muayene bulguları, cerrahi tip, amputasyon ve mortalite açısından değerlendirildi, oranları ve nedenleri analiz edildi.

Bulgular: Hastaların hiçbiri (n=98) Fontaine evre I hastalığı ile başvurmadı. Periferik arter hastalığı genellikle yaşlı popülasyonda gözlendiğinden, ileri yaşta birçok sağlık problemi olan yaşlı hastaların ekstremite amputasyonu geçirme olasılığı daha yüksektir. Bu durum herhangi bir poliklinik muayenesine anklebrakiyal indeks muayenesinin de eklenmesi ile azaltılabilir. Hastalığın diğer evreleri de bu çalışmada detaylı olarak değerlendirildi.

Sonuç: Anklebrakiyal indeks muayenesi, 70 yaş üstü hastalar için sistemik muayeneye dahil edilmelidir. Hali hazırda, bu hastaların çoğunda lomber herni, osteoporoz veya osteoartrit de sık gözlendiğinden periferik arter hastalığının klinik bulguları maskelenmekte ve tanısı gecikmektedir.

Anahtar sözcükler: Periferik arter hastalığı; Ankle Brakiyal İndeks; Amputasyon

INTRODUCTION

Peripheral vascular disease (PAD) is defined as narrowing of blood vessels that restricts blood flow. It mostly occurs in the legs, but is sometimes seen in the arms. Atherosclerosis is the most frequently encountered etiology followed by vasculitis, dysplastic syndromes, degenerative diseases, thrombosis, and thromboembolism. The mortality rate at diagnosis is 4%–6% (1).

Atherosclerotic PAD and related leg amputations increase the mortality rate to 30%, and the 5-year survival rate is less than 30% (2,3). It is important to evaluate and delineate the severity of disease and extent of PAD in the management of these patients.

The incidence of PAD in developed countries ranges from 15% to 30% according to increasing age groups (4-7). In young individuals, the incidence rate is 12% (3). Male patients are more commonly affected, and the incidence in men increases with age (8). According to the results of the Global Burden of Disease Study 2013, the prevalence of the disease increased to 155% since 1990 (9). Hiatt et al. reported that PAD is a significant prognostic indicator of mortality related to myocardial infarction and stroke. In severe chronic PAD, the 1-year mortality rate is 45% (10,11).

The risk factors of PAD include smoking, hypertension, hyperlipidemia, diabetes, obesity, and history of familial vascular disease. According to the survey by the National Health and Nutrition Examination, 95% of the patients exhibit at least one of the risk factors. Approximately 70% of patients are reported to have two or more risk factors (12). Diabetes and smoking cause a 2.5-fold increase in the risk of developing PAD. A linear relationship between the number of cigarettes smoked per day and risk of developing PAD was observed (2,13). Uncontrolled diabetes is a prominent risk factor in rapidly progressing atherosclerosis and coronary artery disease (14). The forms of PAD are more severe in individuals with diabetes that progresses to insulin resistance, and such individuals are 5–10 times more at risk of limb amputation than those without diabetes. Dyslipidemia is also one of the factors correlated to PAD. Elevated serum levels of cholesterol, low-density lipoproteins (LDL), triglycerides, and lipoprotein A are independent risk factors for the development of PAD. Moreover, age is a significant risk factor that increases the risk of developing PAD (15).In patients aged ≥70 years, PAD is a common health concern (2,3). Men are more frequently affected in younger individuals with PAD. The number of affected men and women is equal in patients aged ≥60 years or older (2,3).

Currently, a notable association was observed between PAD and atrial fibrillation, congestive heart failure, obstructive sleep apnea syndrome, chronic renal failure, and other diseases (16). PAD increases the risk of atrial fibrillation, and atrial fibrillation increases the incidence of PAD (15,17).

Acute arterial obstruction in individuals with chronic vascular diseases is a rare phenomenon, and only a limited number of studies have investigated individuals with such disease. The current study aimed to evaluate acute peripheral arterial occlusion that developed as a result of chronic PAD in patients at our institution and to discuss these results in the context of the existing literature.

MATERIALS AND METHOD

Study patients

Between January 2005 and March 2018, 98 patients underwent surgery for acute arterial occlusion due to chronic peripheral arterial disease at our cardiovascular surgery department. These patients were evaluated according to the Fontaine classification as summarized in Table 1. All the patients were evaluated and demographic characteristics, concomitant disease, physical examination findings, type of surgery, and amputation and mortality rates and its causes were analyzed in the present study.The data were taken from the hospital records. Patient and ethic board approvals were obtained.

Table 1. Fontaine classification.

Stage 1	Asymptomatic patients
Stage 2a	Intermittent claudication more than 200 m
Stage 2b	Intermittent claudication less than 200 m
Stage 3	Resting pain
Stage 4	Necrosis and gangrene

Treatment protocols for PAD

The treatment options for PAD are as follows: in newly evolved clinical practice, patients undergo embolectomy with Fogarty catheter and in case of failed embolectomy, revascularization by bypass surgery on suitable segments using autologous (saphenous vein) and synthetic grafts is conducted. In patients who are not eligible for all endovascular procedures and surgical procedures, PGE2 analogue iloprost (1.5mcg/kg/min) is administered for 7 days. After medical therapy, close surveillance of possible complications is conducted. In the present study, all these therapeutic options are performed in the indicated order in majority of the patients.

Statistical analysis

All discrete variables are expressed in percentage. Continuous variables were presented as mean and standard deviation. Descriptive statistical analysis were performed using the Statistical Package for the Social Sciences software version 20 (SPSS v.20, IBM, the USA).

RESULTS

A total of 98 patients were evaluated in the present study. None of the patients presented with Fontaine stage I disease. In the following subsections, we evaluated other stages of the disease in detail.

Stage 2a Disease

A total of 6 patients presented with stage 2a disease. Of these, four (66%) were men, and two (34%) were women. The mean ages of the male and female patients were 69 and 61.5 years, respectively. One (16%) patient had a history of peripheral vascular intervention (PVI). This patient underwent leg amputation. The amputation rate was 16%. No comorbidities were observed in this group. Moreover, none of the patients died.

Stage 2b Disease

A total of 20 patients were included in this group. Fifteen (71%) patients were men and five (29%) patients were women. The mean ages of the male and female patients were 67.8 and 74.1 years, respectively. Twelve (57%) patients underwent PVI. The comorbidities were hypertension (HT) (n=5, 23%), congestive heart failure (CHF)(n=2, 9%), type 2 diabetes mellitus (DM) (n=1, 9%), chronic obstructive pulmonary disease (COPD) (n=1, 4%), chronic renal failure (CRF) (n=1, 4%), and atrial fibrillation (AF) (n=7, 33%). The characteristics of the patients are summarized in Table 2. None of the patients underwent amputation. PVI included embolectomy (n=15, 71%), femoro-femoral extra-anatomic bypass (n=1, 4%), femoropopliteal bypass with saphenous vein graft (n=1, 4%), and axillofemoral extra-anatomic bypass (n=1, 4%). Five (23%) patients who received medical treatment with iloprost were chosen. Data of the patients are summarized in Table 3. Two (8%) patients died, of which one (4%) died due to acute renal failure and the other patient (4%) died due to gastrointestinal system hemorrhage (GIB). The causes and mortality rates are summarized in Table 4.

Stage 3 Disease

A total of 50 patients were included in this group, of which 25(50%) were men and 25 (25%) were women. The mean ages of the male and female patients were 68.3 and 75.6 years, respectively. Twenty-five (50%) patients underwent PVI. The comorbidities were HT (n=24, 48%), CHF (n=26, 52%), DM (n=5, 10%), COPD (n=12, 24%), CRF (n=1, 2%), and AF (n=16, 32%). The comorbidities are summarized in Table 2. A total of eight (38%) patients underwent amputation, of which 2 (6%), 3

Table 2. Summary of comorbidities.

Fontaine	Stage 2a	Stage 2b	Stage 3	Stage 4
History of previous vascular intervention	1 (16%)	12 (57%)	25 (50%)	9 (42%)
Hypertension	-	5 (23%)	24 (48%)	2 (9%)
Heart failure	-	2 (9%)	26 (52%)	2 (9%)
Diabetes mellitus	-	2 (9%)	5 (10%)	3 (14%)
Chronic obstructive pulmonary disease	-	1 (4%)	12 (24%)	-
Chronic renal insufficiency	-	1 (4%)	1 (2%)	-
Atrial fibrillation	-	7 (33%)	16 (32%)	5 (23%)
Previous coronary artery bypass grafting	-	-	4 (8%)	-

(6%), and 2 (4%) patients underwent below-the-knee, ankle-level, and finger amputations, respectively. The distribution of the PVI is as follows:34 (68%) femoral embolectomy, 1 (2%) femoro-femoral extra-anatomic bypass, and 1 (4%) aortobifemoral bypass. Three(16%) patients received medical therapy with iloprost. The summary of the interventions are summarized in Table 3.Two (4%) patients died, of which one died due to metabolic acidosis (2%) and another patient (2%) died due to acute respiratory insufficiency caused by COPD (Table 4).

Stage 4 Disease

A total of 21 patients were included in this group, of which10 (47%) were men and 11 (53%) were women. The mean ages of the male and female patients were 67.2 and 76.3 years, respectively. Nine (42%) patients underwent PVI. The distribution of comorbidities is as follows: HT (n=2, 9%), CHF(n=2, 9%), DM (n=3, 14%),and AF (n=5, 23%). The distribution of comorbidities is summarized in Table 2. Eight (38%) patients underwent amputation, of which 2 (9%), 1 (4%),3 (14%), and 2 (9%) underwent knee-level, above-the-knee-level, ankle-level, and finger amputation, respectively. The distribution of the PVI is as follows: 11 (52%) femoral embolectomy, 1 (4%) femoro-femoral extra-anatomic bypass, 1 (2%) axillofemoral extra-anatomic bypass, 3 (6%) femoropopliteal bypass with saphenous graft, 2 (4%) aortobifemoral bypass, and 1 (2%) iliofemoral bypass. Three (14%) patients received medical therapy with iloprost. The summary of the interventions are summarized in Table 3. Two (9%) patients died, of which one (5%) died due to acute renal insufficiency and another patient died due to dissection of the iliac artery (Table 4).

DISCUSSION

Cardiovascular diseases have underlying causes that are preventable and treatable in most cases. Chronic PAD is considered one of these cardiovascular diseases. To manage these cardiovascular diseases, physicians should be aware of these risk factors. The diagnosis of PAD is simple, and it can be usually performed on bed side during physical examination. In the current study, among the 98 patients treated in the past 13 years, we did not encounter any stage 1 disease. These patients were likely admitted to different departments, such as orthopedics or physical medicine, for extremity and joint pains. Majority of the patients are present with uncertain

intermittent claudication. These patients have an inadequate vascular system, and this is associated with numerous diseases. In relation to this, the diagnosis of PAD will lead to the development of preventive measures to treat other cardiovascular diseases. The primary treatment plan is based on life style changes and reduction of risk factors. This approach will prevent individuals from developing medical problems in the future. Early diagnosis and treatment is important in such patients.

Our study showed that the average ages of patients with stage 2b disease were67.8 in men and 74.1 years in women. The symptomatic stage of PADis commonly observed in the advanced age group. This can be explained more clearly in patients with stage 3 disease, with a mean age of 68.3 years in men and 75.6 years in women. Therefore, stage 3 disease is extremely critical for limb loss. With revascularization, limb salvage can be achieved in this age group. In clinical practice, numerous patients lose time of several weeks owing to leg pain and difficulty in walking at the physical therapy and orthopedic clinics for the diagnosis and treatment of PAD. Therefore, they waste time for the transition to stage 4, which is irreversible for revascularization. However, this diagnosis will be easier if the ankle brachial index (ABI) examination is conducted, which is extremely easy to perform and does not require a long time to perform in outpatient clinics. The ABI is calculated by dividing the systolic pressure at the ankle by the systolic pressure at the arm. It is considered a specific and sensitive metric for the diagnosis of PAD. In addition, ABI is used to predict mortality and adverse cardiovascular events independent of traditional risk factors of CV. The major cardiovascular societies advice measuring the ABI of smokers aged>50 years, individuals with DM who are aged>50 years, and all patients aged >70 years. ABI examination should be included in the systemic examination of patients aged >70 years. Currently, lumbar hernia, osteoporosis or osteoarthritis are also observed in these patients, and the clinical signs of peripheral arterial disease are masked. Due to these diseases, the diagnosis of peripheral arterial disease is delayed. In this way, patients with stage 2b or stage 3 peripheral arterial disease could be diagnosed at an earlier stage and progression to stage 4 can be prevented. The fact that the mean age of male and female participants with stage 4 disease were 67.2 and 76.3 years, respectively, supports this view. We concluded that elderly patients who present with health problems

Table 3. Summary of patient therapies.

Fontaine	Stage 2a	Stage 2b	Stage 3	Stage 4
Amputation	1 (16%)	-	8 (16%)	8 (38%)
Femoral embolectomy	1 (16%)	15 (71%)	34 (68%)	11 (52%)
Femoro-femoral extra-anatomic bypass	-	1 (4%)	1 (2%)	1 (4%)
Axillofemoral extra-anatomic bypass	-	1 (4%)	1 (2%)	1 (4%)
Femoro popliteal bypass with saphenous vein	-	1 (4%)	3 (6%)	-
Aorto-bifemoral bypass	-	-	2 (4%)	1 (4%)
Iliofemoral bypass	-	-	1 (2%)	-
Ilomedin therapy	-	5 (23%)	8 (16%)	3 (14%)

Table 3. Summary of patient therapies.

Fontaine	Stage 2a	Stage 2b	Stage 3	Stage 4
Acute renal failure	1 (4%)	1 (4%)	-	1 (5%)
Gastrointestinal bleeding	1 (4%)	1 (4%)	-	-
Metabolic acidosis	-	-	1 (2%)	-
Pulmonary disease	-	-	1 (2%)	-
Dissection of the iliac artery	-	-	-	1 (5%)

at an advanced age can undergo amputation of the extremity due to this mechanism.

PAD should be considered as an expression of atherosclerotic vascular disease. Asymptomatic or subclinical disease reduces functional capacity and patient's quality of life. After the diagnosis of PAD, the incidence of cardiovascular disorder significantly increases. As critical limb ischemia occurs, cardiovascular disease-related mortality and the risk of morbidity begin to exponentially increase. The mortality rates in these conditions are comparable to that of aggressive malignancies when the population is considered. In the aging population, the prevalence of PAD and critical limb ischemia is progressively increasing. The results of the present study indicate that disease progression is observed in older female population. The treatment options include surgical, endovascular, or medical treatments.

Smoking is the main risk factor both in PAD-related mortality and the development of cardiovascular diseases. Reduced physical activity also plays an important role in increased mortality in these patients. Reduced ABI and the presence of DM-associated PAD have a direct relationship with increased mortality observed in these patients. In the present study, the incidence of comorbidities increased with increasing stages of the disease. The incidence of comorbidities in stage 2a, 2b, 3, and 4 disease is 16%, 71%, 94% and 90%, respectively. These findings indicate that the number of factors affecting the prevalence of cardiovascular diseases increase with the increase in disease stage. This indicates that PAD is a component of multisystemic diseases.

Cessation of smoking positively affects clinical outcome. This is more prominent in younger patients. The international guidelines recommend that physicians should offer patients counseling regarding cessation of smoking (18,19).

DM and ABI are indicators of cardiovascular disease-related mortality. Moreover, the severity and duration of DM affect the development of PAD (20). In the present study, 10 (10.2%) of 98 patients had DM. Studies regarding ABI have conflicting results (21-23). An ABI of <0.5 is significantlyassociated with the risk of mortality from cardiovascular diseases. In the present study, we have found that cardiovascular diseases became more prevalent with the progression of the disease. The incidence of cardiovascular diseases in stages 2b, 3, and 4 disease were 23%, 44%, and 23%, respectively. These patients are significantly at risk of critical extremity ischemia. We have found that the amputation rate and the rate of a proximal level of amputation increased as the disease progressed. The amputation rates in disease at stages 2a, 2b, 3, and 4 were 16%, 0%, 16%, and 38%, respectively.

AF is a significant risk factor in acute arterial occlusion, and it is the most frequently encountered comorbidity in our study. Its incidence among the stages of the disease was similar. AF may be the main factor affecting the evolution of the disease; however, its adverse effects are preventable with appropriate treatment. The rate of PVI increased with AF in our study.

Hyperlipidemia increases all causes of mortality in PAD. Statins used in hyperlipidemia treatment increase walking distance and reduce claudication in patients with PAD (24). In chronic occlusive vascular diseases, we routinely use treatment for anti-hyperlipidemia and monitor LDL and try to maintain the serum levels of LDL at <120 mg/dL.

In conclusion, smoking cessation and increased physical activity reduce cardiovascular disease-related mortality in patients with PAD. The presence of DM and reduced ABI are correlated to cardiovascular disease-related mortality. Surveillance for stage 1 disease must be conducted for an early diagnosis and treatment of these patients. ABI examination should be included in the systemic examination for patients aged >70 years. Currently, osteoporosis or osteoarthritis is also observed in such patients, and the clinical signs of peripheral arterial disease are masked. Due to these diseases, the diagnosis of peripheral arterial disease is delayed. In this way, patients with stage 2b or 3 peripheral arterial disease will be diagnosed earlier and progression to stage 4 disease will be prevented. Patients who are not eligible for any invasive interventions should be listed for medical therapy, and every treatment measure should be considered. In stage 4 disease, amputation should only be considered as treatment option after all other treatments have been performed.

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- Arzu YILDIRIM AR[1]
- Öznur DEMİROLUK[1]
- Yıldız YİĞİT KUPLAY[1]
- Yücel MERİÇ[1]
- Güldem TURAN[1]

CORRESPONDANCE

Arzu YILDIRIM AR
Health Sciences University Fatih Sultan Mehmet, Health Research and Application Center, Intensive Care Unit, Istanbul, Turkey

Phone: +9021655783030
e-mail: dr.arzuyildirim@hotmail.com

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[1] Health Sciences University Fatih Sultan Mehmet, Health Research and Application Center, Intensive Care Unit, Istanbul, Turkey.

RESEARCH

THE ASSOCIATION BETWEEN MODIFIED NUTRITION RISK IN CRITICALLY ILL SCORE AND MORTALITY IN GERIATRIC PATIENTS

Abstract

Introduction: The intensive care unit (ICU) course of geriatric patients differ in various ways from that of younger patients. Geriatric patients admitted to the ICU often have several comorbidities with multiple drug uses. Evaluation of the nutritional status upon initial admission is vital for the geriatric patient. This study aims to retrospectively investigate the association between modified NUTRIC score at first admission with mechanical ventilation duration and mortality in the geriatric patients which constitute the majority of our ICU patients.

Materials and Method: We retrospectively investigated patients admitted to our clinic in 2017 aged above 65 for their age, modified NUTRIC scores, days under invasive and non-invasive ventilation, and comorbidities. Patients under low risk of malnutrition with a modified NUTRIC Score of 0 to 4 comprised Group A while patients with a high risk of malnutrition and a score of 5 to 9 comprised Group B. Both groups were investigated for days under ventilation and mortality.

Results: 14.6% of patients were diagnosed with primary respiratory insufficiency, 34.1% with secondary respiratory insufficiency, 9.8% with intracranial pathologies, 35.4% with postoperative ICU requirement, 4.8% with cardiac arrest and CPR, 0.8% with trauma and 0.5% with malignancies. An association between an increase in modified NUTRIC score and days under mechanical ventilation was not observed. Mortality was significantly higher in Group B. ($p<0.001$) Cut-off value for mortality was defined as 6 for Group B.

Conclusion: We believe the routine use of the modified NUTRIC score for the ICU patients will be beneficial.

Keywords: Nutritional Status; Geriatrics; Malnutrition; Intensive Care Unit

ARAŞTIRMA

GERİATRİ YAŞ GRUBUNDAKİ HASTALARDA KRİTİK HASTALIK MODİFİYE BESLENME RİSK SKORU İLE MORTALİTE ARASINDAKİ İLİŞKİ

Öz

Giriş: Yaşlı hastaların yoğun bakım süreçleri genç hasta grubuna göre çeşitli açılardan farklılık göstermektedir. Yoğun bakıma yatan geriatrik hastaların çoklu hastalıkları ve beraberinde çoklu ilaç kullanım bulunmaktadır. Bununla birlikte ilk yatışta nutrisyon değerlendirmesi de önemli bir parametredir. Çalışmada; yoğun bakım ünitesinde yüksek bir sıklık oluşturan 65 yaş üstü hastalarda retrospektif olarak ilk yatıştaki modifiye NUTRİC skorları ile mekanik ventilasyon gün sayısı ve mortalite ilişkisinin incelenmesi amaçlandı.

Gereç ve Yöntem: Retrospektif olarak klinikte 2017 yılında yatan, 65 yaş üstü hastaların, modifiye NUTRİC skorları, ventilasyon günü (invaziv, non-invaziv), beraber görülen hastalıkları incelendi. Modifiye NUTRİC skoru 0-4 malnütrisyon açısından düşük risk taşıyan hastalar; A grubu, 5-9 arasında malnütrisyon riski yüksek olan hastalar B grubu olarak tanımlandı. Her iki grubun parametreleri, ventilasyon gün sayısı ve mortalite ile ilişkisini incelendi.

Bulgular: Hastaların tanıları; %14.6 primer, %34.1 sekonder solunum yetmezliği, %9.8 intrakraniyal, %35.4 postoperatif, %4.8 post CPR, %0.8 travma, %0.5 malignite idi. Modifiye NUTRİC skorun artması ile mekanik ventilasyon gün sayısında artış kaydedilmedi. Grup B'de mortalitede istatistiksel olarak anlamlı artış bulundu ($p<0.001$). Grup B'de mortalite için cut off değeri 6 olarak belirlendi.

Sonuç: Modifiye NUTRİC skorun yoğun bakım hastalarında rutin kullanımda yer alması yararlı olacaktır.

Anahtar sözcükler: Beslenme Durumu; Geriatri; Malnütrisyon; Yoğun Bakım Ünitesi

INTRODUCTION

There has been an increase in the number of elderly patients who receive therapy in the hospital and intensive care unit due to increase in the elderly population in the community. There has also been an increase in the rate of admission to the hospital, and thereby, to the intensive care unit (1). The course of elderly patients in intensive care differs in various aspects from that of young patients. The prevalence of chronic diseases is higher and organ reserves are diminished in these patients; they also use multiple medications. Mortality rates are higher than those of patients hospitalized the regular ward (2). However, assessment of the nutritional status on initial admission is also an important parameter (3-5). Functional status and particularly nutritional status are very important in geriatric rehabilitation and hospital admission of elderly patients (6).The evaluation of the nutritional status of patients in intensive care on a regular basis in Turkey and quality standards by the ministry of health documentation that is being requested in the light of a parameter.

Different methods and scores are used to assess nutritional risk (7). The Nutrition Risk in Critically ill (NUTRIC) score is the first scoring system dedicated to intensive care unit patients, developed by Heyland et al (Table 1) (8). Although several other scoring systems and assessments also evaluate nutritional risk, they have not been designed specifically for intensive care unit patients. The NUTRIC score predicts 28-day mortality using acute fasting, chronic fasting, acute inflammation, and chronic inflammation markers (age, Acute Physiology and Chronic Health Evaluation [APACHE II] score, Sequential Organ Failure Assessment [SOFA] score, number of comorbidities, time from hospital to intensive care unit admission, IL-6 level).It is recommended that intensive care patients should be used to evaluate the risk of malnutrition. High scores (6–10) indicate high risk of mortality, whereas low scores (0–5) indicate low malnutrition risk. The parameters in the NUTRIC score are easy to use and are frequently used in daily practice, except IL-6. Because routine follow-up of the IL-6 level is not always possible, the adjusted NUTRIC score without IL-6 has been termed modified NUTRIC (mNUTRIC) score. In this scoring system, scores of 5–9 are defined as high scores and those of 0–4 are defined as low scores (3,5,8).

The aim of the present study was to retrospectively evaluate the association between mNUTRIC scores on initial admission and the number of days on mechanic ventilation and mortality in geriatric patients aged 65 years and older who have high rate of admission to our intensive care unit.

MATERIALS AND METHOD

After obtaining the approval of the Scientific Committee of our hospital (17073117-050.99), the data of 396 patients aged over 65 years hospitalized in the Intensive Care Unit of the University between 1 January 2017 and 31 December 2017 were retrospectively evaluated. Our Centre is a tertiary referral hospital with a 20-bed intensive care unit. Patients who were hospitalized for longer than 24 hours were included in the study based on initial admission time. The diagnoses of the patients on initial admission were classified as primary respiratory failure, secondary respiratory failure, neurological causes, postoperative care, post-cardiopulmonary resuscitation, post-traumatic causes and malignancy. Group A comprised patients with mNUTRIC scores of 0–4 and those at a low risk for malnutrition on admission, and Group B comprised patients with mNUTRIC scores of 5–9 and those at a high risk for malnutrition on admission. Demographic data; Acute Physiology and Chronic Health Evaluation (APACHE II) score, Simplified Acute Physiology Score (SAPS 2), mNUTRIC score, Nutrition Risk Score (NRS 2002) and Glasgow Coma Scale (GCS) score averages; number of hospitalization days; number of comorbidities; whether renal replacement therapy was received; mechanical ventilation (invasive, non-invasive) and mortality rates were recorded. The correlation

between the mNUTRIC score and NRS 2002 was assessed in both groups. The correlation between mechanical ventilation time and mortality was evaluated. The correlation between the mNUTRIC score and mortality was examined in both groups.

Statistical analysis

Statistical analysis was performed using SPSS 23.0 statistical software package. Normal distribution of data was tested by the Shapiro–Wilk test. The Mann–Whitney U test was used to compare data without normal distribution between the groups. The relationships between variables were analyzed using Spearman's correlation coefficients. Pearson's chi-square test, Fisher's exact chi-square test and Fisher–Freeman–Halton test were used in the analysis of categorical data. The level of significance (α) was set to 0.05.

RESULTS

Age; APACHE II, SOFA, SAPS II and GCS scores; number of comorbidities and number of hospitalization days were significantly higher in Group B than in Group A (Table 2). There was a difference in primary diagnoses between the groups (Table 3). There was no difference between the groups in terms of the use of renal replacement therapy. There was no correlation between invasive or non-invasive mechanical ventilation times and mNUTRIC scores in both groups. Although there seemed to be a correlation between the NUTRIC score and NRS 2002 in Group A, this association was found to be insignificant and negligible due to a low correlation coefficient. In Group B, there was no significant correlation between the NUTRIC score and NRS 2002. There was no difference in the NUTRIC score between survivors and non-survivors in Group A, whereas NUTRIC scores were different between survivors and non-survivors in Group B (Table2). NUTRIC score distribution of both groups in Table 4. The cut-off value for mortality in Group B was set as 6 (AUC value =0.674, sensitivity: 42.74%, specificity: 84.15% (Figure 1).

DISCUSSION

One of the considerations that should be taken into account for the increasing rate of hospitalization to intensive care units in geriatric patients is that nutritional status of these patients differs from that in younger patients. Therefore, a scoring system used to assess nutritional status in intensive care unit patients must include age, comorbidities and mortality scores. The NUTRIC and mNUTRIC scores are nutritional assessment tools bearing these parameters. In our retrospective review of geriatric patients aged over 65 years, we evaluated the association between the mNUTRIC score on initial admission and mortality, and we found a significant correlation between high NUTRIC scores and mortality.

In a validation study of 401 Asian patients, Mukopadhyay et al. found an association between the mNUTRIC score; body mass index (BMI) and use of mechanical ventilation, vasopressor drugs and renal replacement therapy and 28-day mortality. They also measured energy intake and nutritional adequacy (energy received / recommended energy) and concluded that 28-day mortality can be reduced in patients with a high mNUTRIC score by increasing nutritional adequacy (4). We were unable to obtain 28-day mortality data because this study was designed as a retrospective study. Therefore, the 28-day mortality rate was not included in our study results. However, in our study, the mortality rate was higher in patients with high mNUTRIC scores and the cut-off value formNUTRIC scores for mortality was set as 6.

In a study conducted by Rahman et al, high NUTRIC scores were significantly associated with 6-month mortality rates in 1199 patients. High mortality rates were also observed in patients who received 25% less than the adequate calorie intake (5) ($p<0.0001$).

Mendes et al. considered patients with anmNUTRIC score above 5 as having high nutritional risk in a multi-center observational study

of Portuguese patients and investigated 28-day mortality after admission, number of hospitalization days as well as mechanical ventilation time; they concluded that 28-day mortality risk and length of hospital stay increases and number of days without mechanical ventilation decreases in patients with high NUTRIC scores (9). The mean NUTRIC score was 4.4 in their study. The mean score in the original validation study by Heylandet al. was 4.7. Rahman et al. reported a mean score of 5.5.This value was attributed to the more advanced age of patients and high APACHE II and SOFA scores, as well as the presence of two or more comorbidities(5).In our study, we classified patients with NUTRIC scores of 5as having a high risk and those with NUTRIC scores below 5 as having a low risk. The mean NUTRIC score in our study was 4.6, and this was similar to those reported in other studies. However, unlike other studies, our study results could not observe a correlation between days of mechanical ventilation and mNUTRIC score.

Kalaiselvan et al. conducted a prospective, observational study on 678 patients who underwent mechanical ventilation for more than 48 hours. They found that the length of hospital stay and mortality rate are higher in patients with higher nutritional risks (mNUTRIC score ≥5) than in patients with lower mNUTRIC scores. We also found a similar correlation between mNUTRIC score and mortality in our study (10).

The rate of nutritional risk (NUTRIC score ≥5) was found to be 42.5% in the study by Kalaiselvan et al. and 48.6% in the study by Mendes et al. (9-10). In our study, this rate was 50.25%, consistent with those observed in other studies. We consider that the rate in the present study being close to but higher than those reported in other studies might be caused by the inclusion of geriatric patients aged 65 years and older.

Ozbilgin et al. evaluated subjective global assessment (SGA), Nutritional Risk Index, Nutritional Risk Score (NRS) 2002, Mini Nutritional Assessment, Charlson Comorbidity Index and NUTRIC score; anthropometric measurements and serum total protein, serum albumin and lymphocyte levels to predict morbidity and mortality in 152 patients who were admitted to the postoperative care unit. They found that the NUTRIC score is an important indicator of mortality and morbidity in postoperative surgical patients (11).

In a study of 475 patients conducted in the Netherlands, Viries et al. compared the prognostic performance of the mNUTRIC score with that of the MUST score, which is calculated considering BMI, weight loss in the last 3–6 months and acute disease effect score, to evaluate the nutritional status of non-intensive care unit patients, but which is also commonly used in the intensive care unit. They found that the mNUTRIC score has better prognostic performance than the commonly used MUST score. In our study, the correlation between NUTRIC score and NRS2002 was examined in both groups, but no significant difference was found (12).

Coltman et al. investigated the nutritional status of 294 patients in the intensive care unit using three different scoring systems (NUTRIC score, SGA and the routinely used measurement method at the hospital). Nutritional risk or malnutrition was detected using at least one method in 47% (139 patients) of the patients, and malnutrition risk or malnutrition was foundin63% of the patients by the routinely used method in the institute, in 80% of the patients by SGA and in 26% of the patients by the NUTRIC score. Only nine patients were positive for malnutrition using all the three methods. Patients with malnutrition and a high risk of malnutrition had a lower grip strength, lower BMI and lower body weight. Patients at risk for malnutrition had longer stay in the hospital and intensive care unit and higher in-hospital mortality. The mortality rate was higher in patients with a higher risk as determined by the NUTRIC score (13). Because the NUTRIC score includes the APACHE-2 and SOFA scores, the increase in these values also increases the NUTRIC score. Age; APACHE II, SOFA, SAPS II and GCS scores; number of comorbidities and number of

hospitalization days were significantly increased in parallel with higher mNUTRIC scores (mNUTRIC score ≥5) between the two groups. We think that this is due to the presence of age; APACHE II and SOFA scores and number of comorbidities in the mNUTRIC score calculation criteria. When we examined our results in terms of primary diagnoses, the rates of postoperative patients were higher among patients with low mNUTRIC scores. However, most of the patients with a malignancy were postoperative patients who were admitted after surgery for malignancy. Nowadays, the risk of malnutrition can decrease, the success rate of surgery can increase and the length of stay in the intensive care unit after surgery can decrease by paying attention to the importance of nutrition before and after cancer surgery. Due to these, the general surgery clinic of our hospital prepares patients well in terms of nutritional status in the preoperative period and nutrition is started as soon as possible postoperatively. Reasons, we consider that postoperative patients with a high rate have lower mNUTRIC scores. One of the limiting factors of our study was the retrospective evaluation. Detailed evaluation of nutritional status of geriatric patients in intensive care hospitalization is important and the results of prospective studies may be guiding. Another limiting factor is the absence of long-term mortality results for at least 30 days. Evaluation of long-term mortality results is especially important for geriatric patients.

In conclusion, the NUTRIC score is suitable for use in daily practice in the evaluation of the nutritional status of geriatric intensive care patients, due to parameters included in this scoring system. Awareness of basal nutritional status of geriatric patients is effective in the treatment and care processes of patients. It can also provide additional information on predicted mortality rates besides standard scoring systems such as APACHE II. The results of our study show that NUTRIC scoring can be an important indicator in predicting mortality and length of hospital stay in geriatric patients aged 65 years and older.

Competing interests

The authors declare that they have no competing interests.

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Esra ÇAKIR[1]
Belgin AKAN[1]
Esra SARI[1]
Berkay KÜÇÜK[1]
Işıl ÖZKOÇAK[1]

CASE REPORT

CASE PRESENTATION OF EMERGING SECONDER SARCOPENIA AFTER SEPSIS ATTACKS IN INTENSIVE CARE UNIT

Abstract

Sarcopenia is defined as decreased muscle mass, muscle strength and physical performance. In geriatric patients, secondary sarcopenia may also develop due to underlying diseases in addition to the known primary sarcopenia. Computed tomography and magnetic resonance imaging are the gold standard to calculate skeletal muscle index in the diagnosis of sarcopenia. The diagnostic approach is easier in mobilized, outpatient and hospitalized patient. However, it is difficult to perform a gold standard computed tomography and magnetic resonance imaging for the diagnosis of sarcopenia and evaluate muscle strength and physical performance in patients who cannot be mobilized and stay in the intensive care unit. In this case report, we aimed to present the case in order to raise the awareness of clinicians considering the difficulty of application of diagnostic criteria of secondary sarcopenia in the course of prolonged intensive care unit hospitalization and difficulty of performing computed tomography and the lack of consensus on prevention and treatment of sarcopenia.

Keywords: Intensive Care Unit; Psoas Muscle; Sarcopenia; Muscle, Skeletal

CORRESPONDANCE

Esra ÇAKIR
Health Sciences University, Ankara Numune Education and Research Hospital, Anesthesiology and Clinical of Critical Care, Ankara, Turkey.

Phone: +903125085175
e-mail: pavulonmouse@hotmail.com

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[1] Health Sciences University, Ankara Numune Education and Research Hospital, Anesthesiology and Clinical of Critical Care, Ankara, Turkey.

OLGU SUNUMU

YOĞUN BAKIM ÜNİTESİNDE SEPSİS ATAKLARI SONRASI SEKONDER SARKOPENİ GELİŞEN OLGUNUN SUNUMU

Öz

Sarkopeni azalmış kas kitlesi, kas gücü ve fiziksel performans olarak tanımlanmaktadır. Geriatrik hastalarda bilinen primer sarkopeniye ek olarak altta yatan hastalıklara bağlı sekonder sarkopeni de gelişebilir. Sarkopeni tanısında özellikle iskelet kas indeksi hesaplamak için bilgisayarlı tomografi ve manyetik rezonans görüntüleme altın standarttır. Mobilize olabilen, ayaktan ve servis hastalarında tanısal yaklaşım daha kolaydır. Ancak yoğun bakım ünitesinde yatan ve mobilize olamayan hastalarda sarkopeni tanısı için altın bilgisayarlı tomografi ve manyetik rezonans görüntüleme yapmak ve kas gücü ile fiziksel performans değerlendirmek zordur. Bizim rapor ettiğimiz olguyu, uzamış yoğun bakım ünitesi yatışı sürecinde sekonder sarkopeninin tanı kriterlerinin uygulanmasında ve bilgisayarlı tomografi yapılmasındaki zorluğu, sarkopeninin önlem ve tedavisinde fikir birliği olmaması nedeniyle klinisyenlerin farkındalığını artırmak için sunmayı amaçladık.

Anahtar sözcükler: Yoğun Bakım Ünitesi; Psoas kası; Sarkopeni; İskelet Kası.

INTRODUCTION

Sarcopenia (decreased muscle mass and function) is characterized by cachexia, negative protein and energy balance, multi-organ syndrome, anorexia and decreased physical function (1). Sarcopenia was first described by Rosenberg in 1989 to draw attention to geriatric syndromes associated with decreased muscle mass with aging (2). The prevalence of sarcopenia generally ranges between 6-22% over the age of 65 years (3). It was first defined as primary sarcopenia characterized by decreased muscle mass in the elderly. Then, secondary sarcopenia, which is defined by three main pathogenic mechanisms (inflammatory activity, malnutrition and physical activity disorder), was described. Despite the widely used definition of primary sarcopenia, clinical trials for secondary sarcopenia are still insufficient (4). In particular,there are studies conducted on chronic diseases or in certain hospitalized groups. Although computed tomography (CT) and magnetic resonance imaging (MRI) are the gold standard in the diagnosis of sarcopenia, it is a difficult diagnostic procedure due to high cost and difficulty in clinical practice. Instead, dual-energy X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) are more easily applicable for diagnostic purposes (5). There is little awareness about the prognostic value of sarcopenia in patients with surgery, trauma and cancer, not only in elderly patients who are in intensive care unit (ICU) (6). In this article, we aimed to present a 65-year-old man with chronic lymphocytic leukemia (CLL) in remission who was hospitalized in the ICU for a long time period and diagnosed of sarcopenia by using CT evaluation. As a result, this case would draw attention to the development of secondary sarcopenia in ICU.

CASE

A 65-year-old male patient in remission of CLL for the last 1 year was admitted to the emergency department due to fever (39°C) and respiratory distress. His physical examination revealed bilateral rales, blurred consciousness, and drowsiness. Additionally, the Glasgow Coma Scale score was 4. Heart rate was 106/minute, respiratory rate was 48/minute, and oxygen saturation was 84% in room air. The patient was intubated due to respiratory failure. The blood pressure was 80/60 mmHg. Therefore, he was immediately treated with serum saline infusion. Subsequently, appropriate intravenous fluid administration and inotropic treatment were started. Furthermore, bilateral infiltration was detected on chest X-ray examination. Respiratory acidosis was detected in blood gas examination.He had normal liver and kidney functions. Leukopenia (506 cells/mm^3) and increased C-reactive protein (CRP) (342 mg/L) (our hospital reference levels: 0-5 mg/L) were identified. Eventually, he was transferred to the ICU with pre-diagnosis of pneumonia, sepsis and CLL relapse. Cranial CT scan was performed due to lethargy and confusion, andrelieved normal findings. After admission to ICU, whole body fluid cultures were obtained, and then initial empirical intravenous (IV) antibiotics (ceftriaxone, vancomycin, and acyclovir) were started. Streptococcus pneumoniasusceptible to ceftriaxone was yielded in both cerebrospinal fluid and blood culture. Vancomycin and acyclovir treatments were discontinued after culture results. Ceftriaxone treatment was continued until negative control cultures. In hematological evaluation, CCL relapse was not considered in peripheral smear and bone marrow examination. The patient was extubated on the 19th day of hospitalization and started full enteral nutrition on the 25th day. The patient's calorie intake was regulated as 20–25 kcal/kg/day and protein intake was regulated to have 1.5 g/kg body (7). On the 26th day of hospitalization, the patient had fever (39.3°C), respiratory distress, lethargy, bilateral rales, respiratory acidosis, leukocytosis (22.400 cells/mm^3) and CRP: 285 mg/Lwhich were indicated sepsis and pneumonia. Therefore, respiratory support was initiatedwith mechanical ventilator (MV). Subsequently, Acinetobacter baumannii was detected in the blood culture, and colistin was administered for 14 days

for nosocomial pneumonia and sepsis. Respiratory physiotherapy was started and continued during hospitalization. In the follow-up, tracheostomy was applied because of extubation failure, and percutaneous endoscopic gastrostomy (PEG) was applied to maintain his nutrition.

On the 53rd day of hospitalization, sarcopenia was suspected because of failure in weaning from MV, low body mass index (17,4kg/m^2, cut-off <20kg/m^2), low muscle mass, low muscle strength and low physical performance. Subsequently, CT, which was recognized the gold standard diagnostic method and the first of three diagnostic criteria for sarcopenia, was used to evaluate the skeletal muscle index (SMI) (8). Since, the patient's state of consciousness was not suitable, an informed consent was obtained from his relatives before CT examination. Image was obtained to calculate SMI from caudal region of the third lumbar (L3) vertebrae to evaluate the right and left psoas muscle, which was the best determinative area of muscle mass in abdominal CT. Thus, SMI was calculated as a total psoas muscle area divided by height squared (Figure 1). Also, total muscle area (TMA, in cm^2) is measured at L3 using a semi-automatic segmentation software (Figure 2). The TMA was then normalized to obtain SMI in cm^2/m^2 (2). The patient's SMI was found to be 48.6 cm2/m2 (cut-off < 52.4 for sarcopenia in male) according to the formula SMI=(skeletal muscle mass/body mass) × 100, which was used by Janssen et al. to define sarcopenia (9). The psoas muscle area (PMA), which was the core muscle that reflects the condition of skeletal muscle in the whole body, was calculated as 12.1 (cut-off <16.8 for sarcopenia) in our patient (10). Low muscle strength and low physical performance could not be evaluated with diagnostic tests for two other criteria of sarcopenia in the patient who was not able to orientate and cooperate. The patient was considered to have low muscle strength and low physical performance because of inadequate respiratory effort and poor mobility of the extremities. In the laboratory analysis hypoalbuminemia (1.8 g/dL) and concurrent CRP (4 mg/L) associated with sarcopenia were normal (to exclude inflammatory causes) (1). Nutritional supplementation (daily caloric intake of 30 kcal/kg, protein intake of 2 g/kg body weight, vitamin D replacement) and exercise program were started for the patient who was diagnosed sarcopenia secondary to infection (11,12). The patient was discharged with tracheostomy with MV support and PEG on the 115th day of hospitalization. The relatives of the patient provided written informed consent before all procedures.

Figure 1. Psoas muscle lumbar 3 section with computed tomography for calculation of skeletal muscle index.

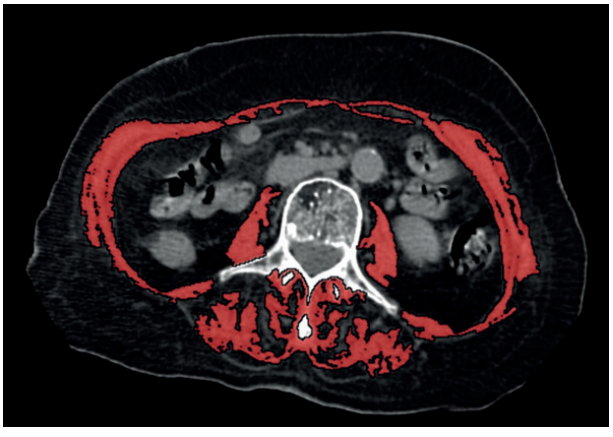

Figure 2. Total muscle area of lumbar 3 section obtained using semi-automatic segmentation software.

DISCUSSION

Sarcopenia is defined as age-related reduction in skeletal muscle mass. Its incidence is 29% in elderly people and 33% in patients required long-term palliative care. However, its incidence is not clear in ICU (5). The pathophysiology of sarcopenia is multifactorial. Decreased calorie intake, muscle fiber denervation, intracellular oxidative stress, cytokinesis, endocrine and metabolic factors as well as genetic predisposition may cause sarcopenia. Difficulty in weaning of the patients from MV support is associated with prolongation of hospitalization, and acute and chronic weakness of the muscles (1,5).

Nevertheless, the relationship between neuromuscular acquired weakness and secondary sarcopenia is not fully known. In addition, it may not be possible to prevent muscle loss due to increased catabolism in the first period. Although proper protein intake and exercise have been used successfully to treat weakness in older patients (primary sarcopenia), it is possible to fail in severe catabolic status as in our patient, even if standard treatment is applied in sarcopenia due to secondary conditions (5,13). Studies on sarcopenia in patients admitted to the ICU are lacking. Therefore, secondary sarcopenia should be kept in mind for the patients who are cared in the ICU for a long-term period(11). If sarcopenia is overlooked, and not diagnosed and treated early in time, it is associated with increased morbidity and mortality (5,13).

Muscle mass (i), muscle strength (ii) and physical performance (iii) should be evaluated to diagnose sarcopenia based on modern definitions. Screening for sarcopenia is recommended in both elderly patients and patients with significant reduction in physical function (5). The European Working Group on Sarcopenia in Older People (EWGSOP) proposed three stages of sarcopenia: pre-sarcopenia (presence of one criterion), sarcopenia (two criteria), and severe sarcopenia (three criteria) (8). There are some difficulties in assessing ICU patients from a diagnostic standpoint. If patients with sarcopenia are orientated and cooperated enough related to age and disease status, muscle strength and physical performance can be evaluated. As in our patient, central nervous system disease and prolonged respiratory support without sedation and weakness can be considered as indicators of low muscle strength and low physical performance (5,13). Imaging methods used to measure muscle mass are ultrasound (US), MRI, CT, DXA, and BIA. Ultrasonography, DXA and BIA are easy techniques to use for the diagnosis (13). However, the CT and MRI, which are the gold standard methods to evaluate muscle mass ofpatients in ICU, are difficult to perform and expensive (5).However, it is thought that the patient should be evaluated with CT for a more accurate diagnosis of muscle mass (13). It has been shown that cross sectional muscle surface at the third L3 best reflects total skeletal muscle mass determined by CT or MRI. In practice, TMA is measured at L3 using a semi-automatic segmentation software on a dedicated post-treatment station. TMA is then normalized to stature (using height^2 in m^2) to obtain the SMI in cm^2/m^2 (2,9). The cut-off value of sarcopenia in men is <52.4, while the cut-off value of sarcopenia in women is declared to be <38.5 (1.9). Our patient SMI was found to be 48.6 cm^2/m^2 (for men) according to the SMI. The PMA, which was the core muscle that reflects the condition of skeletal muscle in the whole body, was calculated as 12.1 (cut-off <16.8 for sarcopenia) in our patient (10). The patient who was considered to have sarcopenia based on the diagnostic criteria, should receive proper treatment and exercise. However, despite proper medical treatment, exercise, protein and energy support, MV support and length of hospitalization of the patient were prolonged due to secondary sarcopenia. Therefore, some criteria and tools should be used to assess the morbidity and mortality of critically ill patients during the hospitalization. Once sarcopenia suspected, it should be diagnosed early, and supportive treatment should be started immediately. (14). As in our patient, sepsis is a risk factor for prolonged

ventilator and acquired neuromuscular weakness, which may be a common problem of patientsin ICU (15). We aimed to present our case to ensure that secondary sarcopenia shouldbe considered and draw attention to diagnostic difficulties in patients with prolonged ventilation and duration of hospitalization in ICU despite the treatment of primary disease and proper physical therapy, energy and protein support. There is a need for further advanced studies on the frequency of sarcopenia, its progress during the hospitalization, proper nutritional requirement, normal SMI attainment, duration of hospitalization and effect on mortality especially in patients in ICU.

Conflict of interest

None.

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■ Yavuz Sultan Selim YILDIRIM[1]
■ Nihat SUSAMAN[1]
■ Orkun EROĞLU[1]

CASE REPORT

A RARE CASE OF CONCHA BULLOSA OSTEOMA IN A GERIATRIC PATIENT

Abstract

The most common location of osteoma is the mandible in head and neck. In the paranasal sinuses, it is most commonly located in the frontal sinus and then in the ethmoid and maxillary sinuses, respectively. Osteomas appear rarely in the nasal cavity and even more rarely in the turbinates. A sixty six year old woman who had presented with complaints of nasal obstruction, left-sided facial pain and headache was referred to our department. Paranasal sinus computed tomography (CT) revealed a pneumatized left middle turbinate, and on coronal, sagittal, and axial CT sections an ellipsoid hyperdense lesion measuring approximately 22 x 13 mm was evident inside the left aerated middle turbinate. We performed an endoscopic partial turbinectomy under general anesthesia. The patient had no complaints during the subsequent 3-month follow-up. The pathologic diagnosis was osteoma.

Keywords: Turbinates; Osteoma; Nasal Surgical Procedures; Aged

CORRESPONDANCE
Yavuz Sultan Selim YILDIRIM
Elazığ Fethi Sekin Research and Training Hospital, Otolaryngology Clinic, Elazığ, Turkey.

Phone: +904246066000
e-mail: yssyildirim@hotmail.com

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[1] Elazığ Fethi Sekin Research and Training Hospital, Otolaryngology Clinic, Elazığ, Turkey.

OLGU SUNUMU

YAŞLI HASTADA NADİR GÖRÜLEN KONKA BÜLLOZA OSTEOMU OLGUSU

Öz

Baş boyun bölgesinde en sık mandibulada yerleşen osteomlar paranazal sinüsler içerisinde sırasıyla frontal, etmoid ve maksiller sinüslerde görülür. Nazal kavitede nadir görülen osteomların konka yerleşimi ise çok daha nadirdir. Bu çalışmamızda burun tıkanıklığı, yüzün sol tarafında ağrı ve baş ağrısı şikayetleri ile kliniğimize başvuran altmış altı yaşında bayan hasta sunulmuştur. Hastanın paranazal sinüs tomografisinde pnömatize sol orta konka ve içerisinde koronal, sagital ve aksiyel kesitlerde görülen yaklaşık 22x13 mm boyutlarında, elipsoid hiperdens bir lezyon saptandı. Hastaya genel anestezi altında endoskopik parsiyel türbinektomi operasyonu yapıldı. Patolojik tanısı osteom olarak raporlanan hastada postoperatif 3 aylık takip süresi boyunca herhangi bir komplikasyon gelişmedi.

Anahtar sözcükler: Konka; osteom; Nazal cerrahi işlemler; İleri yaş

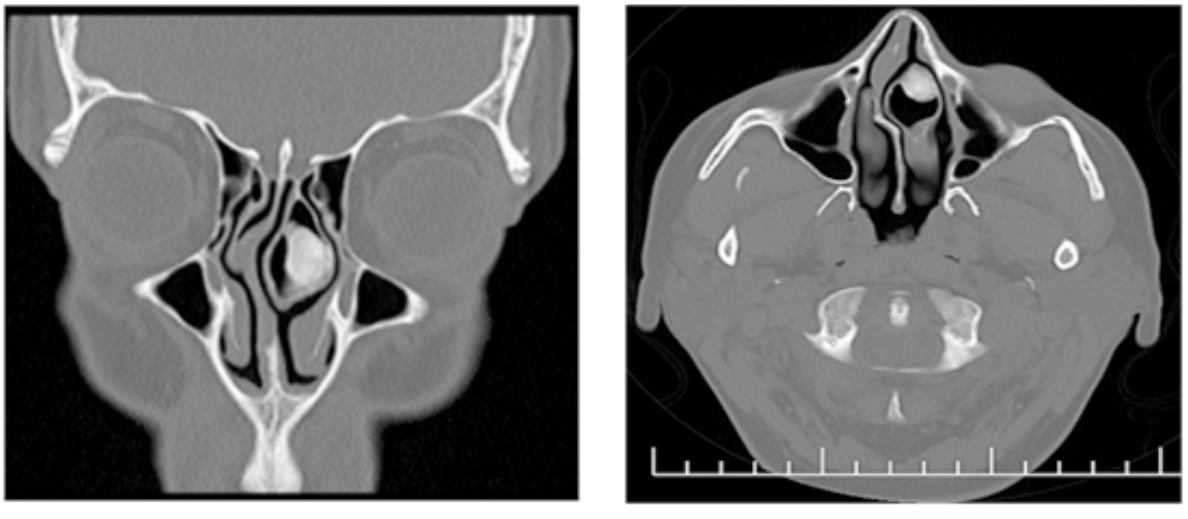
INTRODUCTION

Osteomas are slow-growing benign tumors that originate from bone tissue. The most common location is the mandible. While its incidence is generally unknown, its prevalence has been found to be 1–3% in studies involving patients with osteoma detected via direct radiography and computed tomography (1). In the paranasal sinuses, it is most commonly located in the frontal sinus and then in the ethmoid and maxillary sinuses, respectively (2). Osteomas appear rarely in the nasal cavity and even more rarely in the turbinates. In a literature review, we identified 9 cases of concha settlements (3-11). Concha bullosa of the middle turbinate is the most common anatomical variation in the middle turbinate. Concha bullosa is similar to that of the paranasal sinuses, and is characterized by mucociliary clearance. It is thus sensitive to pathological formations such as paranasal sinuses. In the aforementioned literature review we only identified two previously reported cases of osteoma in the concha bullosa, and herein we present a third case. The present case is the first report of concha bullosa osteoma in a geriatric patient.

CASE

A 66-year-old woman reported suffering from nasal obstruction and intermittent left-sided headaches and facial pain for the previous 1.5 years. She had no history of nasal surgery or trauma. In a nasal endoscopy examination her nasal mucosa appeared normal but hypertrophy of the left middle turbinate and a septal deviation to the right side were evident. Paranasal sinus computed tomography (CT) revealed a pneumatized left middle turbinate, and on coronal, sagittal, and axial CT sections an ellipsoid hyperdense lesion measuring approximately 22 x 13 mm was evident inside the left aerated middle turbinate (Figure 1). This bony lesion was situated in the anterior part of the left middle turbinate concha bullosa. The septum was deviated to the right.

Figure 1. (a) Coronal and (b) axial computed tomography scans of the paranasal sinuses showing a large, dense bony lesion inside the left aerated middle turbinate.



We performed an endoscopic partial turbinectomy under general anesthesia. After administering 2% xylocaine with adrenaline (1:100,000) via injection we performed a vertical incision on the anterior wall of the left middle turbinate, then created a plane between the bony lesion and the mucosal surface of the lateral lamella. After removal of the lateral lamella, the bony enlargement within the concha bullosa was separated from the inner surface of the medial lamella, preserving the middle turbinate's attachment to the lamina cribrosa. After removal of the lateral lamella we completely resected the bony lesion. The removed lesion measured approximately 22 x 12 x 10 mm (Figure 2). The patient had no complaints during the subsequent 3-month follow-up.

Figure 2. The bony lesion removed from the patient.

CONCLUSION

In recent years the rate of incidentally diagnosed osteoma has increased due to an increase in surgical interventions for paranasal sinuses, developments in endoscopic sinus surgery, increased radiological examinations for paranasal sinuses, and especially an increase in the utilization of CT. It has been reported that osteomas in patients aged 30–40 years were the most common frontal sinus paranasal sinuses. In a study of 1889 patients conducted from 2006 to 2008, Erdoğan et al. (12) reported that 55% of osteomas were located in the ethmoid sinuses, which is not concordant with numerous other reports (13). Although paranasal sinus osteomas are frequently detected in the ethmoid complex, the aerated middle turbinate is an exceptionally rare site of osteoma origin and only two such cases have previously been reported (7,11).

The etiology of osteoma is currently unknown. Most osteomas are sporadic, but they can also be observed as part of a syndrome (6). The standard diagnostic method for the diagnosis of osteomas is CT. In CT they are depicted as hyperdense markedly delineated lesions.

In general, a conservative approach is utilized in the treatment of osteomas. The recommended approach in elderly patients, especially those with no complaints, is to follow for changes in tumor size . In a case series conducted over 10 years, Halawi et al. (14) examined the growth patterns of osteomas and reported that the mean annual growth was approximately 0.117 mm. However, they did not identify any factors associated with this growth. In the present case we performed surgical intervention due to complaints of nasal obstruction and headache.

The main approach to symptomatic osteomas is surgical intervention, which can be performed externally or endoscopically. The choice of technique varies according to the size and location of the osteoma and its relationship with adjacent structures, but in recent years most reported cases have been treated endoscopically due to advances in endoscopic sinus surgery. In the present case the location and size of the tumor rendered it suitable for endoscopic excision, which was performed successfully. Where possible, an endoscopic approach is superior to an external approach due to a lack of scarring of the skin, reduced trauma and associated preservation of mucociliary clearance, less morbidity, and a shorter hospital stay (15).

Though solitary osteoma with concha bullosa is an extremely rare finding, it should be included in the differential diagnoses of rhinogenic headaches and/or unusual pathological formations in the pneumatized middle turbinate. An endoscopic approach is the preferable treatment option. Histopathological diagnosis is particularly important for the differential diagnosis of osteogenic tumors, especially ossifying fibroma and fibrous dysplasia. The present case is the first report of middle concha bullosa osteoma in a geriatric patient.

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