VIA MEDICA

ORIGINAL ARTICLE

Cardiology Journal
2011, Vol. 18, No. 3, pp. 282–288

ISSN 1897–5593

Prevalence of orthostatic hypotension in a series of elderly Mexican institutionalized patients

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Abstract

Background: *Orthostatic hypotension (OH) is a common problem among the elderly. It is associated with an increase in morbidity and mortality, but its prevalence in Mexico is unknown.*

Methods: *We conducted a cross-sectional prospective study of intern patients at several Mexican elderly assistance institutions. We carried out a history and took blood pressure readings in a seated position, immediately after standing up, and again after 3 min of standing up.*

Results: *We evaluated 132 patients, mean age 82.3 ± 9.5 years, 74.1% of them female. Thirty-nine (29.3%) subjects had OH. They had a higher prevalence of hypothyroidism, Parkinson's disease, depression and alcoholism. Their Minimental result was 15.45 ± 7.2* vs *16.12 ± 7.9 (p = 0.6) among those without OH, and their quality of life (Minnesota scale) was 12.1 ± 7.3* vs *9.15 ± 7.05 (p = 0.03). They used more ACEI, digoxin and levothyroxin. Hypertension and alcoholism showed respectively a RR of 2.6 (95% CI 0.9–7.6, p = 0.06) and 3.18 (95% CI 0.96–10.48, p = 0.05) to develop OH.*

Conclusions: *OH was present in 29.3% of the studied population. A third of them had hypertension. The use of different medications does not solely explain OH, so it is necessary to look for different associations. Among those, chronic alcoholism stands out. OH is associated with a poorer quality of life and cognitive performance. OH is asymptomatic in most cases.* (Cardiol J 2011; 18, 3: 282–288)

Key words: orthostatic hypotension, elderly, alcoholism, Parkinson, autonomic dysfunction

Introduction

Orthostatic hypotension (OH) is a relatively common finding in elderly people. It has been calculated that 15–55% of the residents of a retirement home may have an abnormal blood pressure (BP) regulation [1–4]. These BP changes can be related to many factors.

Older patients show several changes in the complex autonomic regulation of BP as part of the adaptations related to ageing. They show an increase in plasma norepinephrine levels and a decrease in beta-adrenergic receptors sensitivity. There is also a reduction in the alpha-mediated vasomotor response, a lower baroreflex sensitivity and parasympathetic tone. These complex interactions

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Received: 19.10.2010 Accepted: 16.12.2010

occur in a stiff vascular system influenced by endothelins, a decay in nitric oxide production and atherosclerosis. At the heart level, there is a reduction in pacemaker cells in the sinus node, and a worse calcium re-uptake that induces abnormal ventricular relaxation. All these conditions facilitate neurally mediated syncope or dysautonomic reflexes [3, 5, 6]. Older people are prone to the autonomic dysfunctions induced by chronic illnesses such as diabetes, Parkinson's disease or pure autonomic failure.

Older people commonly use several medications, especially anti-hypertensive drugs, since hypertension affects 30% of Mexico's adult population according to national surveys [7, 8].

Some studies in assistance facilities or retirement homes have shown a mean of 3.5 chronic illnesses per person. And at least one third of people aged above 65 routinely use three different medications. A recent study showed that these numbers can go up to 6.1 ± 2.6 drugs, of which 4.7 ± 1.9 are potentially fall-inducers [3, 9–12].

Some studies have been able to relate frequent falls to OH, although there are contradictory results regarding the specific role of OH as a fall risk factor. Some authors suggest that the frequency of both problems is so high that even a multifactorial analysis could not find a significant risk increase [3, 9].

There is evidence that OH is also associated with an increase in the risk for stroke or brain vascular disease, nocturnal hypertension, myocardial infarction and accelerated atherosclerosis [1, 13––16]. All these risks jeopardize the patient's quality of life (QoL), something that can also be influenced by OH symptoms themselves.

OH detection is important in terms of prevention, since only 25% of patients show any symptoms. So falls or other QoL-compromising conditions can be wrongly attributed to different diseases [17].

Although there is disagreement regarding OH definition, the most widely accepted one is a reduction of 20 mm Hg in systolic BP or a 10 mm Hg reduction in the diastolic record in the first three stand-up minutes [17–19].

In Mexico there have been several studies aimed at the evaluation of hypertension treatment. OH appears as a complication of such treatment, but we don't know the specific features of OH as an autonomic dysfunction. Our study is the first attempt to establish OH prevalence in our country.

Methods

We conducted a cross-sectional prospective study to identify OH in elderly adults in public or private care institutions, which were selected according to their willingness to collaborate in our study. Every adult older than 65 years of age who was a resident of any of the participating institutions and signed an informed consent (approved by the University's Ethics Committee) was included in the study. If the patient had a mild degree of dementia that did not preclude a convenient information retrieval, or if they had a complete hospital record they were also included in the study.

People with an incomplete history, or who were incapable of answering questions regarding their history or quality of life or Minimental, or of remaining standing for 3 min, were excluded from the study.

We excluded anyone with an incapacitating dementia that precluded history taking or precluded an adequate comprehension of what was involved in giving informed consent.

Once the informed consent was signed and history data completed (from interrogation and institutional records), we performed the BP measurements using aneroid oscillometric sphygmomanometers previously calibrated with mercury equipment. Researchers performed the measurements with a standardized technique according to the JNC VII and national guidelines [19, 20].

Basal lectures were recorded in a seated position (after at least five minutes' rest), and then after one minute of standing up and after three minutes of standing up. We diagnosed orthostatic hypotension when there was a drop in systolic BP equal to or higher than 20 mm Hg, a diastolic fall equal to or higher than 10 mm Hg, or where there was a combination of both.

We express continuous variables as means ± ± standard deviation and categorical variables as percentages. We used Student's T for comparisons, as well as χ^2. A logistic regression analysis was made to search for possible risk associations.

Results

We evaluated 135 intern patients of several publicly- and privately-run elderly assistance institutions in the city of Querétaro. Three cases were excluded from analysis because they couldn't sustain standing up for 3 min. The mean age of the group was 82.35 ± 9.5 years and 100 (74.1%) were female. Thirty-nine (29.3%) cases had OH. Of these, 11 had both systolic and diastolic hypotension, while the others had either systolic or diastolic hypotension. In nine (6.7%) cases there was a BP reduction higher than 16 mm Hg but less than 20 mm Hg, without significant diastolic changes but with associated

Table 1. Main characteristics and history.

	Orthostatic hypotension	Non-orthostatic hypotension	P
N	39 (29.3%)	94 (70.7%)	
Age (years)	83.3 ± 9.4	82.2 ± 9.5	0.5
Gender (female)	30 (76.9%)	68 (72.3%)	0.5
Hypertension	14 (35.9%)	33 (35.5%)	0.9
Diabetes	4 (10.3%)	22 (23.7%)	0.07
Myocardial ischemia	1 (2.6%)	5 (5.4%)	0.4
Stroke	3 (7.7%)	4 (4.3%)	0.4
Renal failure	0	1 (1.1%)	0.5
Hypothyroidism	3 (7.7%)	2 (2.2%)	0.1
Cancer	0	3 (3.2%)	0.2
Syncope	1 (2.6%)	3 (3.2%)	0.8
Falls	13 (33.3%)	34 (36.6%)	0.8
Liver disease	0	1 (1.1%)	0.5
Vascular dementia	10 (25.6%)	22 (23.4%)	0.7
Alzheimer's	1 (2.6%)	2 (2.1%)	0.8
Parkinson's	3 (7.7%)	4 (4.3%)	0.4
Depression	4 (10.3%)	7 (7.4%)	0.6
Alcoholism	7 (17.9%)	10 (10.6%)	0.3
Smoking	11 (28.2%)	20 (21.3%)	0.2

Table 2. Minimental and Minnesota Quality of Life (QoL) scores.

	Orthostatic hypotension	Non-orthostatic hypotension	P
N	39 (29.3%)	94 (70.7%)	
Minimental	15.45 ± 7.2	16.12 ± 7.9	0.6
Total QoL score	12.1 ± 7.3	9.15 ± 7.05	0.03
Energy	0.89 ± 1.1	0.58 ± 0.9	0.1
Pain	2.7 ± 2.5	1.7 ± 2.2	0.03
Emotional	1.9 ± 2.2	1.4 ± 1.9	0.5
Sleep	1.6 ± 1.6	1.06 ± 1.4	0.08
Social isolation	1.1 ± 1.2	1.07 ± 1.3	0.9
Physical activity	3.8 ± 2.3	3.2 ± 2.5	0.2

symptoms. We did not include these patients in the OH group. Table 1 shows the main characteristics of the OH group and the other patients.

The same table shows that patients with OH had a higher prevalence of hypothyroidism, Parkinson's disease, depression and chronic alcohol consumption, even if the differences were non-significant. Patients without OH had a higher prevalence of ischemic heart disease, diabetes, cancer and syncope.

Table 2 shows the main Minimental and Minnesota Quality of Life (QoL) scores. In both scales, patients with OH perform more poorly than non-OH patients. The significant differences, however, are present in general QoL, and specifically in the pain measure. Sleep quality is also worse in subjects with OH, although it does not reach statistical significance.

Table 3 shows the changes in mean systolic and diastolic BP. Significant differences were found between the non-OH individuals at the first stand-up minute.

Table 4 shows the main symptoms associated with stand-up time. There are some differences in the presence of nausea, weakness and syncope in the third minute, although they don't reach statistical significance.

We checked the number of medications and comorbidities in each group. Patients with OH used

Table 3. Blood pressure changes.

	OH	p (OH *vs* non-OH)	Non-OH
Baseline SBP	129.7 ± 18.6	0.14	124.6 ± 16.7
Min 1 SBP	112.7 ± 18.3	0.01	121.9 ± 18.9
p (baseline *vs* min 1)	> 0.0001	–	0.03
Min 3 SBP	119.5 ± 19.3	0.2	123.6 ± 17.8
p (baseline *vs* min 3)	0.001	–	0.6
Baseline DBP	75.9 ± 15.02	0.04	70.3 ± 10.9
Min 1 DBP	67.3 ± 12.1	0.03	72.5 ± 12.6
p (baseline *vs* min 1)	> 0.0001	–	0.01
Min 3 DBP	70.6 ± 13.8	0.2	73.7 ± 13.7
p (baseline *vs* min 3)	0.004	–	0.1

Table 4. Symptoms related to position changes (sitting–standing).

Symptom	Orthostatic hypotension	Non-orthostatic hypotension	P
Baseline dizziness or vertigo	2 (5.1%)	4 (4.3%)	0.5
1st stand up min. dizziness	1 (2.6%)	3 (3.2%)	0.6
3rd stand up min. dizziness	3 (7.7%)	7 (7.5%)	0.6
Baseline nausea	1 (2.6%)	1 (1.1%)	0.5
1st stand up min. nausea	0	1 (1.1%)	0.7
3rd stand up min. nausea	1 (2.6%)	1 (1.1%)	0.5
Baseline diaphoresis	0	0	0.7
1st stand up min. diaphoresis	0	0	0.7
3rd stand up min. diaphoresis	1 (2.6%)	2 (2.1%)	0.6
Baseline weakness	4 (10.3%)	8 (8.5%)	0.4
1st stand up min. weakness	5 (12.8%)	12 (12.8%)	0.5
3rd stand up min. weakness	9 (23.1%)	14 (15.4%)	0.1
Baseline syncope	0	0	0.5
1st stand up min. syncope	0	0	0.5
3rd stand up min. syncope	1 (2.6%)	0	0.5

1.72 ± 2 drugs, while subjects without OH used 2.67 ± 2.5 (p = 0.07). There were patients who did not use any medication at all, and patients who used up to ten different compounds. Table 4 shows the medications more used by these patients and the differences among both groups. In the OH group, ten (25.6%) patients used more than three medications. In the non-OH group, 45 (47.9%) (p = 0.01) patients did so.

In the OH group, the mean co-morbidities present was 1.56 ± 1.02, and in the non-OH group it was 1.9 ± 1.18 (p = 0.5).

Finally, we conducted a backwards step-by-step multivariate logistic regression analysis to evaluate the findings where there were significant differences (or nearly significant). The elements associated with an increased risk for OH were hypertension, (RR 2.6, 95% CI 0.9–7.6, p = 0.06) and chronic alcohol intake (3.18 95% CI 0.96–10.48, p = 0.05). Other variables were discarded in the first steps. Even if they seemed clinically relevant, none was statistically significant.

Discussion

The prevalence of OH in this series is within the ranges found in other studies. Many of our patients have relatively little co-morbidity and use a small number of medications, compared to the findings by other authors, even if they are older [9–12].

Among the most prevalent co-morbidities in the OH group, there are several diseases known because of their potential effect on the autonomic nervous system, such as Parkinson's disease and

depression, although in the non-OH group diabetes is more prevalent, a disease that shows among its neuropathic complications autonomic dysfunction [21–27]. We must consider that the most usual manifestations of diabetic dysautonomic behavior are related to an increase in the baseline heart rate and a decrease in heart rate variability [27]. This higher prevalence of diabetes explains the difference regarding the use of biguanides and sulfonylureas in the non-OH group. We will discuss medications later, but there is no apparent relationship between hypoglucemiant drugs and dysautonomic reflexes, although there is some antiarrhythmic potential for sulfonylureas.

A national registry found an incidence of 10% of OH among patients with Parkinson's disease [21]. In our series, 7.7% of the subjects with OH had Parkinson's.

Chronic alcohol intake is an interesting finding because even if the difference is non-significant, it appears to be clinically relevant, as shown by the logistic regression analysis. It is known that acute alcohol intake is related to high BP, but there is little information regarding chronic use or abuse of alcohol and autonomic dysfunction [28, 29]. Subclinical abnormalities can be detected by sympathetic cutaneous response, and some patients might also have OH, even after ceasing to drink [29, 30]. This supports our findings, but we must remember that only 17% of our patients with OH had a history of chronic alcohol abuse.

Both the Minimental and Minnesota QoL scores were worse in the OH group. It is possible that repeated episodes of hypotension might make vascular dementia symptoms more evident. As shown in Table 1, the proportion of patients with vascular dementia (diagnosed at the assistance center) is slightly higher in the OH group. This might explain the differences in the Minimental score. The study's design does not allow the establishment of whether OH is a causative factor for vascular dementia.

Hypertension is an element that does not show significant differences regarding proportions, but logistic regression analysis suggests that it might be an important risk factor for OH.

Another study has demonstrated that hypertensive subjects show a close relationship between the level of BP control and their Minimental score. In other words, worse BP control is associated with a worse Minimental score [32]. Nonetheless, the same study showed that such a correlation is lost in people over the age of 80. In our series, the mean age is above 80 years, a factor that could influence the test's results. Possibly a larger series could elicit a better discrimination.

Regarding QoL, the differences between groups are significant and this suggests that OH-related symptoms might be more severe than previously thought. Chronic pain has been related to different manifestations of autonomic dysfunction. A relevant syndrome such as fibromyalgia has been related to neurocardiogenic syncope, an autonomic dysfunction of the same 'family' as orthostatic hypotension, i.e. the neurally mediated syncopes [6, 33–39] but none of these patients had diagnosed fibromyalgia. There have been many publications regarding the effect of chronic inflammatory diseases (lupus, rheumatoid arthritis, schleroderma) on the autonomic function, but whether chronic arthrosis pain has some effect on autonomic regulation has not been described to our knowledge.

It is difficult to explain the differences regarding sleep quality. Several diseases such as Parkinson's are related to sleep disorders and they show a dysautonomic behavior, in the same way that some medications are able to induce OH and sleep disorders. Risperidone, for example, is frequently associated with OH, but only two subjects in our series were using it [40–42].

Regarding pharmacological treatments, our group showed great heterogeneity. Some patients used no medications at all, while some used up to ten different drugs, even if the mean quantity of drugs is lower than that reported by other authors [9, 11]. Perhaps this regulation of drug use is related to the care provided by geriatric specialists in the studied institutions. Polypharmacy is a common phenomenon addressed by gerontologists [43–48]. Even if there were no significant differences, the OH group used fewer diuretics, dehydropiridinic calcium channel blockers and benzodiazepines, but they used more angiotensin converting enzime inhibitors (ACEI), digoxin and levothyroxine. The ACEI group has the potential to induce OH, and nearly a third of our patients used them. The group without OH used more beta-blocking agents, non-steroidal anti-inflammatory drugs (NSAIDs), vitamins and glucose-lowering drugs. Both OH and non-OH groups used potentially OH inducing drugs, although the non-OH group used more serotonin reuptake inhibitors and beta-blockers (drugs commonly used in the treatment of neurally mediated syncope) even if their benefit is questionable in such a context [6, 48, 49]. These patients without OH used more NSAIDs, that are related to high BP. Even if the mean BP measurements are within

normal limits, the use of NSAIDs may somehow contribute to avoiding OH [50, 51]. An apparently paradoxical observation is that diuretics are less common in the OH group [52, 53]. This possibly has to do with the fact that OH itself, or the patient's age, are facts to consider when giving anti-hypertensive treatment in these medically supervised facilities. Even in the presence of several significant differences regarding druguse between groups, logistic regression analysis did not show any possible causative relationship.

Regarding symptoms, we selected the ones in Table 3 because in previous works we had found that nausea, dizziness and diaphoresis were associated with a higher risk of having a positive Head-Up Tilt Test (HUTT) [54–56]. Even if the OH diagnosis is clinical and does not require HUTT, it shares some features with the commonest cause of autonomic dysfunction i.e. neurally mediated syncope [6]. We found no significant differences (possibly because of the number of patients) except for weakness perception and syncope in the third minute. Symptom absence is an important feature from a clinical standpoint, since this could explain a certain number of the falls referred to by the patients in their history and supports other authors' findings [9–11]. This finding also implies the need to implement or reinforce fall-related lesions prevention, since the absence of symptoms makes accidents more plausible.

Limitations of the study

Our main limitation was the number of patients, even though we included people from several institutions. Even with different sorts of populations, the measurement tools and data capture were the same.

Conclusions

Orthostatic hypotension was present in nearly 30% of the studied population. Among these subjects, one third had hypertension, which is a risk factor to develop OH. Medication use can hardly explain OH in our group, so it is necessary to look for other associations, and among them, chronic alcohol consumption is a striking one.

Orthostatic hypotension implies worse QoL scores and is also associated with poorer cognitive functions, so it is important to prevent or avoid it, as well as to treat it promptly, in order to avoid this negative impact on QoL. Symptoms do not seem to be a relevant factor in QoL, since many patients are asymptomatic. This condition should prompt the establishment or reinforcement of preventative measures to avoid falls and fall-related injuries.

Acknowledgements

We wish to thank the following organizations for their invaluable help with the present work: Luz al Ocaso Residencia para Ancianos, Residencia Villa de Guadalupe, Asilo de ancianos La Divina Providencia, Residencia para ancianos San Francisco de Asís, Asilo de ancianos San Sebastián.

The authors do not report any conflict of interest regarding this work.

References

1. Verwoert G, Mattace-Raso F, Hofman A et al. Orthostatic hypotension and risk of cardiovascular disease in elderly people: The Rotterdam Study. J Am Geriatr Soc, 2008; 56: 1816–1820.
2. Gupta V, Lipsitz L. Orthostatic hypotension in the elderly: Diagnosis and treatment. Am J Med, 2007; 120: 841–847.
3. Lipsitz L, Grubb B. Syncope in the elderly. In: Grubb B, Olshansky B eds. Syncope, mechanisms and management. 2nd Ed. Blackwell-Futura, Armonk, Virginia 2005: 301–314.
4. Poon O, Braun U. High prevalence of orthostatic hypotension and its correlation with potentially causative medications among elderly veterans. J Clin Pharm Ther, 2005; 30: 173–178.
5. Lamarre M. Syncope in older adults. Geriatrics Aging, 2007; 10: 236–240.
6. Asensio E, González JA, Ramírez LL. Guías para el manejo del síncope: Diagnóstico y tratamiento. Sociedad Mexicana de Electrofisiología y Estimulación Cardiaca, Guías de práctica médica en arritmias cardiacas. 1ª Edición, 2007–2009. Edición patrocinada por Medtronic, México DF.
7. Velázquez O, Rosas M, Lara A, Pastelín G, Attié F, Tapia R, Grupo ENSA 2000. Hipertensión arterial en México: Resultados de la Encuesta Nacional de Salud (ENSA 2000). Arch Inst Cardiol, 2002; 72: 71–84.
8. Rosas M, Lara A, Pastelín G et al. Re-encuesta nacional de hipertensión arterial (RENAHTA): Consolidación mexicana de los factores de riesgo cardiovascular. Cohorte nacional de seguimiento. Arch Inst Cardiol, 2005; 75: 96–111.
9. Liu B, Topper A, Reeves R. Falls among older people: Relationship to medication use and orthostatic hypotension. J Am Geriatr Soc, 1995; 43: 1141–1145.
10. Tinetti M, Williams T, Mayewski R. Fall risk index for elderly patients based on number of chronic disabilities. Am J Med, 1986; 80: 429–434.
11. Lipsitz L. Pluchino F, Wei J. Syncope in institutionalized elderly: The impact of multiple pathological conditions and situational stress. J Chronic Dis, 1986; 39: 619–630.
12. Van der Velde N, Van den Meiracker A, Pols H, Stricker B, Van der Carmenn T. Withdrawal of fall-risk-increasing drugs in older persons: Effect on tilt table test outcomes. J Am Geriatr Soc, 2007; 55: 734–739.
13. Masaki K, Schatz I, Burchfiel C et al. Orthostatic hypotension predicts mortality in elderly men: The Honolulu Heart Program. Circulation, 1998; 98: 2290–2295.
14. Atli T, Keven K. Orthostatic hypotension in the healthy elderly. Arch Gerontol Geriatr, 2006; 43: 313–317.
15. Luukinen H, Koski K, Laippala P, Airaksinen K. Orthostatic hypotension and the risk of myocardial infarction in the home-dwelling elderly. J Intern Med, 2004; 255: 486–493.

16. Carmona J, Amado P, Vasconcelos N et al. Does orthostatic hypotension predict the ocurrence of nocturnal arterial hypotension in the elderly patient? Rev Port Cardiol, 2003; 22: 607–615.
17. Vara L, Domínguez R, Fernández M et al. Prevalencia de la hipotension ortostática en ancianos hipertensos tratados en atención primaria. Aten Primaria, 2001; 28: 151–157.
18. Weiss A, Chagnac A, Beloosesky Y, Weinstein T, Grinblat J, Grossman E. Orthostatic hypotension in the elderly: Are the diagnostic criteria adequate? J Hum Hypert, 2004; 18: 301–305.
19. Chobanian A, Bakris G, Black H et al. Seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure: Complete report. Hypertension, 2003; 42: 1206–1252.
20. Rosas M, Pastelín G, Martínez J et al. Hipertensión arterial en México. Guías y recomendaciones para su detección y tratamiento. Arch Cardiol Mex, 2004; 74: 134–157.
21. Wüllner U, Schmitz T, Anthony G et al. Autonomic dysfunction in 3,414 Parkinson's disease patients enrolled in the German Network on Parkinson's Disease (KNP e.V.): The effect of ageing. Eur J Neurol, 2007; 14: 1405–1408.
22. Dubow J. Autonomic dysfunction in Parkinson's disease. Dis Mon, 2007; 53: 265–274.
23. García R, López P, Tomaz C. The role played by the autonomic nervous system in the relation between depression and cardiovascular disease. Rev Neurol, 2007; 44: 225–233.
24. Cabezas-Cerrato J, Hermida R, Cabezas-Agrícola J, Ayala D. Cardiac autonomic neuropathy, estimated cardiovascular risk and circadian blood pressure pattern in diabetes mellitus. Chronobiol Int, 2009; 26: 942–957.
25. Rosengard M, Bernardi L, Fagerudd J et al. Early autonomic dysfunction in type 1 diabetes: A reversible disorder? Diabetologia, 2009; 52: 1164–1172.
26. Jyotsna V, Sahoo A, Sreenivas V, Deepak K. Prevalence and pattern of cardiac autonomic dysfunction in newly detected type 2 diabetes mellitus. Diabetes Res Clin Pract, 2009; 83: 83–88.
27. Pop-Busui R. Cardiac autonomic neuropathy in diabetes: A clinical perspective. Diabetes Care, 2010; 33: 434–441.
28. Ishizaki K, Harada T, Yamaguchi S et al. Relationship between impaired blood pressure control and multiple system involvement in chronic alcoholics. No To Shinkei, 1995; 47: 139–145.
29. Escobar F, Espì F, Herrrero F, Benages A. Tests of autonomic cardiovascular function in chronic alcoholism. Analysis of 100 patients. Rev Clin Esp, 1986; 179: 392–396.
30. Nazliel B, Arikan Z, Irkec C, Karakilic H. SSR abnormalities in chronic alcoholics. Addict Behav, 2007; 32: 1290–1294.
31. Duncan G, Johnson R, Lambie D, Whiteside E. Evidence of vagal neuropathy in chronic alcoholics. Lancet, 1980; 2: 1053–1057.
32. Obisesan T, Obidesan O, Martins S et al. High blood pressure, hypertension and high pulse pressure are associated with poorer cognitive function in persons aged 60 and older: The third national health and nutrition examination survey. J Am Geriatr Soc, 2008; 56: 501–509.
33. Bar K, Greiner W. Pain perception is not influenced by altered autonomic function in major depression. Psychiatr Prax, 2007; 34 (suppl. 3): S309–S313.
34. Staud R. Autonomic dysfunction in fibromyalgia syndrome: Postural orthostatic tachycardia. Curr Rheumatol Rep, 2008; 10: 463–466.
35. Birklein F, Riedl B, Sieweke N, Weber M, Neundörfer B. Neurological findings in complex regional pain syndromes, analysis of 145 cases. Acta Neurol Scand, 2000; 101: 262–269.
36. Crofford L. Violence, stress and somatic syndromes. Trauma Violence Abuse, 2007; 8: 299–313.
37. Solano C, Martinez A, Becerril L et al. Autonomic dysfunction in fibromyalgia assessed by the Composite Autonomic Symptoms Scale (COMPASS). J Clin Rheumatol, 2009; 15: 172–176.
38. Martínez-Lavín M, Hermosillo AG. Autonomic nervous system dysfunction may explain the multisystem features of fibromyalgia. Semin Arthritis Rheumatol, 2000; 29: 197–199.
39. Martinez-Lavin M; Vargas A. Complex adaptive systems allostasis in fibromyalgia. Rheum Dis Clin North Am, 2009; 35: 285–298.
40. Stacy M. Medical treatment of Parkinson's disease. Neurol Clin, 2009; 27: 605–631.
41. Chan D, Cordato D, O'Rourke F. Management for motor and non-motor complications in late Parkinson's disease. Geriatrics, 2008; 63: 22–27.
42. Yoritaka A, Ohizumi H, Tanaka S, Hattori N. Parkinson's disease with and without REM sleep behaviour disorder: Are there any clinical differences? Eur Neurol, 2009; 61: 164–170.
43. Steinman M, Rosenthal G, Landefeld C, Berthenthal D, Kaboli P. Conflicts and concordance between measures of medication prescribing quality. Med Care, 2007; 45: 95–99.
44. Lien C, Gillespie N, Struthers A, McMurdo M. Heart failure in frail elderly patients: Diagnostic difficulties, co-morbidities, polypharmacy and treatment dilemmas. Eur J Heart Fail, 2002; 4: 91–98.
45. Hanlon J, Shmader K, Ruby C, Weinberger M. Suboptimal prescribing in older inpatients and outpatients. J Am Geriatr Soc, 2001; 49: 200–209.
46. Colt H, Shapiro A. Drug-induced illness as a cause for admission to a community hospital. J Am Geriatr Soc, 1989; 37: 323–326.
47. Fulton M, Riley E. Polypharmacy in the elderly: A literature review. J Am Acad Nurs Pract, 2006; 17: 123–132.
48. Asensio E, Castillo L, Oseguera J et al. Response to treatment during medium-term follow-up in a series of patients with neurocardiogenic syncope. Arch Med Res, 2004; 35: 416–420.
49. Moya A, Sutton R, Ammirati F et al. Guidelines for the diagnosis and management of syncope (version 2009). Eur Heart J, 2009; 30: 2631–2671.
50. Wang J, Mullins C, Mamdani M, Rublee D, Shaya F. New diagnosis of hypertension among celecoxib and nonselective NSAID users: A population based cohort study. Ann Pharmacother, 2007; 41: 937–943.
51. Krum H, Swergold G, Curtiss S et al. Factors associated with blood pressure changes in patients receiving diclofenac or etoricoxib: Results from the MEDAL study. J Hypertens, 2009; 27: 886–893.
52. Mussi C, Ungar A, Salvioli G et al. Orthostatic hypotension as cause of syncope in patients older than 65 years admitted to emergency departments for transient loss of consciousness. J Gerontol A Biol Sci Med Sci, 2009; 64: 801–806.
53. Low P. Prevalence of orthostatic hypotension. Clin Auton Res, 2008; 18 (suppl. 1): 8–13.
54. Asensio E, Oseguera J, Loría A et al. Clinical findings as predictors of positivity of head-up tilt table test in neurocardiogenic syncope. Arch Med Res, 2003; 34: 287–291.
55. Asensio E, Colín E, Castillo L et al. Comportamiento diferencial de la tensión arterial de pacientes con síncope neurocardiogénico en la fase inicial de la prueba de inclinación. Arch Inst Cardiol Mex, 2006; 76: 59–62.
56. Asensio E, Castillo L, Galindo J, Narváez R, Dorantes J, Rebollar V, Orea A. Differential blood pressure behavior as an early predictor of the outcome of head-up tilt table test among patients with neurally mediated syncope. The Internet Journal of Cardiology, 2008; 5 (2): http://www.ispub.com/ostia/index.php?xmlFilePath=journals/ijc/vol5n2/bp.xml.