DETECTING ARRHYTHMIAS IN ELDERLY PEOPLE (OVER 75 YEARS OF AGE) WITH ECG HOLTER MONITORING COMPARED TO CLASSIC ELECTROCARDIOGRAM

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Abstract: *It is common knowledge that people over the age of 75 have a high incidence of arrhythmias. Materials and methods: 200 patients over the age of 75 were enrolled in the study. All the subjects filled in a data sheet with the main pathological data; afterward, they underwent a standard 12-lead electrocardiogram and, following planning, a 24-hour Holter monitoring. Results: Atrial fibrillation was detected in 20% of the patients. 4% of patients had pacemakers (single-chamber demand - VVI 3%, dual chamber pacing and sensing - DDD 1%). Arrhythmias detected in sinus rhythm subjects consisted in supraventricular extrasystoles in 8% of the patient and ventricular extrasystoles in 8% of the patients, too. At the same time, 4% of the patients had first and second degree atrioventricular block. The results were similar for 24 hours Holter monitoring. In conclusion, 24-hour Holter monitoring is better than the 12-lead electrocardiogram in detecting fast and slow heart rhythm abnormalities in elderly patients.*

INTRODUCTION

It is common knowledge that people over the age of 65, chiefly over 75, have a high incidence of arrhythmias related to changes in the electrical activity of the heart with aging.(1) It has been reported an increasing prevalence of atrial flutter, and especially atrial fibrillation, the latter amounting to 4-8% in the general population at this age.(2) Similarly, brady-tachy syndrome, sinus node dysfunction and atrioventricular block reach highest incidence in the elderly population.(3)

On the other hand, the incidence and prevalence of abnormal heart rhythms increase because of structural heart diseases such as hypertensive and ischemic heart disease, cardiomyopathy, degenerative valve disease and, naturally, heart failure with the highest occurrence rate in this category of patients.(4)

As far as structural diseases are concerned, it has been reported an increase in both supraventricular and ventricular rapid rhythm disorders, including ventricular tachycardia or even sudden death caused by ventricular fibrillation.(5)

Among the causes leading to changes in the normal electrical activity of the heart we should mention myocardial tissue alterations resulting in fibrosis and myocardial fibrillar collagen degradation, arterial compliance loss and physiologic diastolic dysfunction with delayed relaxation filling pattern characterizing the so-called "aging heart".(6) Blood vessels undergo age-related alterations caused by physiologic remodeling with calcification, collagen content increase and concomitant elastin content decrease, as well as by the presence of endothelial dysfunction.(7) All the aforementioned physiological causes lead to pressure overload, elevated myocardial oxygen consumption and relative ischemia.(7)

Age-related alterations are similar but nevertheless different from those caused by the aforementioned diseases, chiefly high blood pressure, atherosclerosis and lately diabetes mellitus, which are also high risk factors for heart rhythm abnormalities.(8)

Naturally, physiologic or pathologic changes result in either the formation of reentry circuits prevalent in rapid heart rate or atrioventricular nodal and intraventricular conduction disturbances leading to slow heart rate, namely sinus node dysfunction and atrioventricular block.(9)

Customarily, arrhythmias are detected with a standard 12-lead electrocardiogram recorded when the patient becomes symptomatic.

However, we should point out that certain manifestations of heart rhythm alterations such as syncope, presyncope, intermittent confusion syndrome, unexplained same-level falls, asthenia, and dizziness are not always accompanied by feeling fast or slow heartbeats.

At the same time, age-related cognitive decline in a significant percentage of elderly people makes the correlation between palpitations or heart rhythm abnormalities and symptoms more difficult to detect.

Therefore, all elderly patients with ischemic symptoms (chiefly cerebral but also in other areas) or with peripheral embolism are recommended classic electrocardiogram.(2) But the electrocardiogram records only a fragment, a moment in the electrical activity of the heart and may leave undetected a whole range of heart rhythm abnormalities.

Although cardiology guides recommend long-term Holter or "loop recorder" monitoring only in patients with symptoms suggestive of cardiac arrhythmias (10), we deemed useful a comparative analysis of 24-hour Holter monitoring and classic electrocardiogram used to detect heart rate abnormalities in people over the age of 75 irrespective of the presence or absence of symptoms suggestive of cardiac arrhythmias.

MATERIALS AND METHODS

Two hundred patients over the age of 75 selected from the databases of the general practitioners in Baia-Mare

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were enrolled in the study. Apparently, healthy subjects were included side by side with patients with known cardiovascular diseases: arterial hypertension, ischemic heart disease, congestive heart failure, aortic stenosis, stroke etc.

All the subjects enrolled in the study filled in a data sheet with the main pathological data; afterward they underwent a standard 12-lead electrocardiogram and, following planning, a 24-hour Holter monitoring.

For the ECG Holter monitoring, we used a 10 electrodes 12 leads device.

Even though the data were evaluated automatically, they were double-checked by manual verification of how accurate the detection of arrhythmias was and by "manual" analysis of the conduction system in order to detect bradycardias.

In interpreting the ECC Holter as well as the 12-lead electrocardiogram results, we took into account not only slow or rapid heart rate abnormalities, but also the ischemic alterations, namely the presence of downsloping ST-segment depression ≥ 1mm 0.08 seconds after the J point was measured.

Statistical analysis was carried out using the SPSS for Windows software programs. The results were presented as numbers and percentages for qualitative variables and as mean ± standard deviation or median values for quantitative variables. Data were compared using Student (for quantitative variables) and $\chi 2$ test (for qualitative variables). A value of $p < 0.05$ was considered statistically significant.

RESULTS

Among the 200 patients over 75 years of age enrolled in the study, 120 were women (60%) and 80 men (40%).

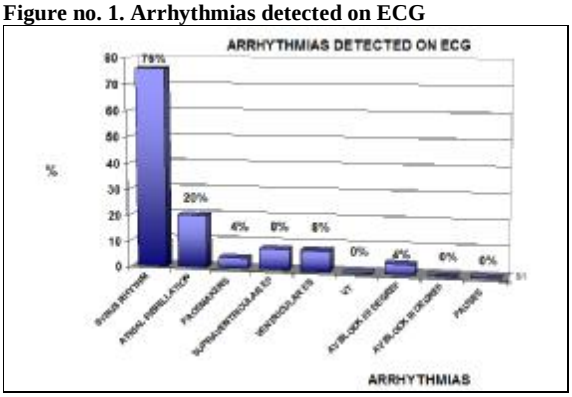
The general cardiovascular pathology characteristics of the group and the main available laboratory parameters are summarized in table no. 1.

Table no. 1. Patient's characteristics

		Number	Percent
Patient's number		200	100%
Age (years)	75-80	158	79
	>80	42	21
Medium	Urban	130	65
	Rural	70	35
CARDIOVASCULAR RISK FACTORS			
Smokers	Yes	50	25%
	No	150	75%
Hypertension	Normal values	70	35
	Moderate	50	25
	Severe	80	40
BMI (kg/m2)	<25	70	35
	>25	130	65
Diabetes mellitus	Yes	18	9
	No	182	91
Total cholesterol (mg/dl)	<200	44	22
	>200	156	78
Triglycerides (mg/dl)	<150	52	26
	>150	148	74
CARDIOVASCULAR DISEASES			
Myocardial infarction	Yes	11	5.5
	No	189	94.5
Heart failure	Yes	12	6
	No	188	94
Ischemic heart disease	Yes	30	15
	No	170	85
Valvular disease	Yes	3	1.5
	No	197	98.5
Stroke	Yes	9	4.5
	No	191	95.5
Renal failure	Yes	5	2.5
	No	195	97.5
ABI (ankle-brachial index)	<0.9	160	80
	>0.9	40	20
Heart rate	<60	70	35
	60-80	100	50
	>80	30	15
SYMPTOMS			
Dyspnea	Yes	69	34.5
	No	131	65.5
Dizziness	Yes	30	15
	No	170	85
Chest pain	Yes	14	7
	No	186	93
Syncope	Yes	20	10
	No	180	90

The data concerning heart rhythm abnormalities are summarized in figure no. 1. The analysis of the electrocardiogram at rest revealed the presence of sinus rhythm in 76% of the cases.

Figure no. 1. Arrhythmias detected on ECG



The rate of subjects in sinus rhythm was 77.5% men and 75% women.

Atrial fibrillation was detected in 20% of the patients, namely in 15% of the men and 27.5% of the women. Among the subjects without cardiovascular pathology, atrial fibrillation occurred in 4% of the men and 6% of the women. Of the total 200 patients, 4% had pacemakers and their ECG recorded the cardiac stimulation rhythm (VVI 3%, DDD 1%).

We should also mention that only 30 of the 40 patients with atrial fibrillation knew that they had a heart rhythm abnormality. Eight patients had atrial fibrillation with average rapid ventricular rate and 2 with spontaneous slow ventricular response (sinus node dysfunction).

Arrhythmias detected in sinus rhythm subjects consisted in supraventricular extrasystoles in 8% of the patients (7.5% men, 4.2% women) and ventricular extrasystoles in 8% of the patients (7.5% men, 8.2% women).

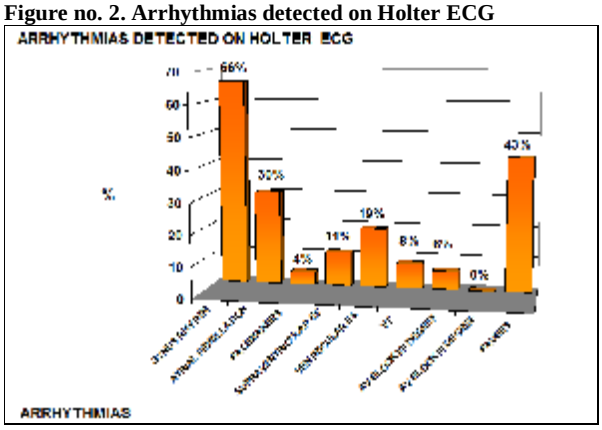
At the same time, 4% of the patients (4.2% men, 3.9% women) had first and second degree atrioventricular block.

Neither electrocardiogram recorded repetitive ventricular extrasystoles (they were isolated in all cases) or ventricular tachycardia episodes. Similarly, no third degree atrioventricular block or sinus pause was recorded. Sinus bradycardia with or without bradycardia treatment was reported in 35% of the subjects, namely 37.5% of the men and 33.3% of the women.

The results were similar for 24-hour Holter monitoring (figure no. 2) but the rates of detecting rhythm abnormalities were higher. Accordingly, sinus rhythm was recorded in only 66% of the subjects, and paroxysmal or persistent atrial

fibrillation in 30%, a 10% higher rate than according to standard ECG.

Figure no. 2. Arrhythmias detected on Holter ECG



Atrial fibrillation with slow ventricular response was detected in 3% of the patients. The percentage of pacemaker holders was obviously similar.

Differences were also recorded with respect to supraventricular extrasystoles, namely 11% of the subjects had such abnormality, and the discrepancy was even higher in what concerned ventricular extrasystoles, recorded in twice as many patients, namely 19%. We should point out that of the 19% patients with ventricular extrasystoles, 3% had sustained or non-sustained ventricular tachycardia. Of the patients with atrial fibrillation, 5% also manifested episodes of ventricular tachycardia. All in all, 8% of the patients had episodes of ventricular tachycardia, 7% of whom manifested non-sustined episodes.

First and second degree atrioventricular blocks were detected in 6% of the patients, but no third degree atrioventricular block.

Among the subjects in sinus rhythm, 50% had sinus pauses of more than 2 seconds, 10% of more than 3 seconds; all were asymptomatic. Among the patients with atrial fibrillation, only 20 had sinus pauses of more than 3 seconds, and one patient had an asymptomatic more than 4 seconds sinus arrest.

While standard electrocardiogram at rest recorded ischemia in only 10% of the patients, Holter monitor readings documented ischemia in 15% of the subjects. Of the patients whose ischemia was detected by Holter monitoring, 10 were asymptomatic and had no idea of their disease (had not been previously diagnosed with ischemic cardiomyopathy). Retrospectively correlating the data supplied by the electrocardiogram at rest with the results of the 24 hours Holter monitoring, 10 patients confirmed having experienced presyncopal episodes they have formerly ascribed to neurological disorders, transient ischemic attack (TIA). Only 4 subjects associated them with the presence of atrial fibrillation. The patient with sustained ventricular tachycardia recorded during the night was asymptomatic, the self-limited sustained ventricular tachycardia being actually recorded during sleep. Similarly, except for the subject with atrial fibrillation and more than 4 seconds sinus arrest who was symptomatic but his symptoms were likewise ascribed to neurological disorders, the rest of the patients were asymptomatic. The retrospective analysis also enabled us to diagnose angina pectoris in 2 of the patients with ischemia, and to ascribe the sustained ventricular tachycardia of the one patient who suffered from it to ischemia because the ECG documented noticeable ischemic changes before ventricular tachycardia.

DISCUSSIONS

It has been demonstrated that the incidence of heart rhythm abnormalities increases with age.(2) As shown in the introduction, the phenomenon is due, on the one hand, to the degenerative changes in the excito-conductor system, myocardium and peripheral vessels and, on the other, to the rise in heart disease incidence rate.(6) The latest advances in health care enable us to extend life expectancy for people with all kinds of heart diseases, but these developments have a definite impact on heart rhythm abnormalities due to the evolution of heart diseases towards heart failure, notoriously arrhythmogenic and often bringing about a high risk of sudden death.(11)

Therefore, in elderly people chiefly over the age of 75 (the real “old people”) arrhythmias are not only common and symptomatic, but can also develop symptoms that might hide their real cause.(12) The patients may not feel the heart rhythm abnormalities as such, namely fast, slow or irregular beats but complain of manifestations resulting from the impact of arrhythmias on various blood circulation areas, mostly the brain.(13) For that reason, all patients with stroke (chiefly those with transient ischemic attack) that has no clear-cut explanation or signs of peripheral ischemia (chiefly embolic stroke), and not only, must be investigated for paroxysmal arrhythmias and first and foremost for atrial fibrillation.(2)

Similarly, patients with repetitive syncopal attacks not clearly related to a cerebrogenic origin must raise the suspicion of intermittent bradycardia and be investigated for the slow heart rates that originate it. Most often the arrhythmias can be recorded by standard electrocardiogram, but in many cases it is not enough. This is the reason why patients with unusual symptoms that may well be the result of transient arrhythmias should undergo Holter monitoring that could supply additional relevant data to the information provided by an even repeated 12-lead electrocardiogram.(14)

Whereas ambulatory ECG monitoring is suitable for apparently healthy elderly patients who display several symptoms that cannot be explained or point at a potential arrhythmia, the situation is completely different for elderly cardiac patients because ischemic heart disease, cardiomyopathies, and heart failure, very common at this age, have a high arrythmogenic risk. That is why the arrhythmias need to be accurately detected, on the one hand, for prognostic evaluation and, on the other, for immediately initiating adequate therapeutic measures.

Therefore, all patients with heart failure (chiefly systolic and with ejection fraction < 30 – 35 %) must as a rule undergo ECG Holter monitoring at least for 24 hours.(15)

Of course, patients with reduced ejection fraction are recommended prophylactic implantable cardioverter defibrillator (ICD) therapy, but in many countries, ours included, it is impossible because it is too expensive. Consequently, Holter monitoring can be a method for selecting the people who really need this modern treatment.(16)

At the same time, Holter monitors should be more often used for patients who complain of sudden and unexpected decline in their physical working capacity or of certain night symptoms (including insomnias and nigh dyspnea) that could be explained by paroxysmal bradycardia irrespective of the fact that the latter is associated with sinus node dysfunction or with atrioventricular block.(17)

As reported above, almost half of the subjects enrolled in the study had bradycardia at rest. The latter is most often the manifestation of a sinus dysfunction that may develop in a sinus node dysfunction and in these patients, chiefly if they have unusual symptoms, Holter monitoring can easily provide a diagnostic that may without delay lead to adequate therapeutic

measures, namely at implementing single-chamber atrial pacing (AAI), VVI, or DDD modes of artificial electrical cardiac stimulation.(16,17)

It is vital to detect the presence of ventricular arrhythmias since they may lead to sudden death.(18) For that reason, all the people with high arrhythmia risk due to heart failure, chronic ischemic heart disease as well as chronic kidney disease must be investigated for the presence of potentially malignant ventricular arrhythmias.(18,19) In most cases, standard electrocardiogram is enough when associated with system case history, but sometimes 24-hour Holter monitoring supplies additional data chiefly detecting fast heart rates. If the latter are treated, the prognostic of these patients can be significantly improved.(15,19)

This is the reason why Holter monitoring should not be now regarded as a luxury or an optional investigation for elderly patients. On the contrary, it must be an important factor in the accurate diagnosis and detection of arrhythmias as causes of uncommon symptoms usually ascribed to other causes: transient ischemic attack, heat failure etc.(20,21,22)

In conclusion, we believe that a 24 hours Holter monitoring is better than the 12-lead electrocardiogram in detecting fast and slow heart rhythm abnormalities in elderly patients and it should be recommended whenever clinical symptoms point at a potential intermittent arrhythmia or when the elderly patient has a disease with high arrhythmogenic risk.

REFERENCES

1. Toda N. Age related changes in the transmembrane potential of isolated rabbit sino-atrial nodes and atria.Cardiovascular Research. 1980;14(1):58-63.
2. Camm AJ, Lip GY, De Caterina R, Savelieva I, Atar D, Hohnloser SH, et al. ESC Committee for Practice Guidelines-CPG; Document Reviewers. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation: an update of the 2010 ESC Guidelines for the management of atrial fibrillation--developed with the special contribution of the European Heart Rhythm Association. Europace. 2012;14(10):1385-413.
3. Stewart S, Hart CL, Hole DJ, McMurray JJ. Population prevalence, incidence, and predictors of atrial fibrillation in the Renfrew/Paisley study. Heart. 2001;86(5):516-21.
4. Lloyd-Jones DM, Wang TJ, Leip EP, Larson MG, Levy D, Vasan RS, et al. Lifetime risk for development of atrial fibrillation: the Framingham Heart Study. Circulation. 2004;110(9):1042-6.
5. Merghani A, Sharma S. Identifying patients at risk of sudden arrhythmic death. Practitioner. 2012;256(1755):15-8.
6. Donato AJ, Morgan RG, Walker AE, Lesniewski LA. Cellular and molecular biology of aging endothelial cells. J Mol Cell Cardiol. 2015; pii: S0022-2828(15)00034-6.
7. Gjesdal O, Bluemke DA, Lima JA. Cardiac remodeling at the population level-risk factors, screening, and outcomes. Nat Rev Cardiol. 2011;8(12):673-85.
8. Kazemian P, Oudit G, Jugdutt BI. Atrial fibrillation and heart failure in the elderly. Heart Fail Rev. 2012;17(4-5):597-613.
9. Jones SA, Lancaster MK, Boyett MR. Ageing-related changes in connexins and conduction within the sinoatrial node. The Journal of Physiology. 2004;560(2):429-37.
10. Sposato LA, Cipriano LE, Saposnik G, Ruíz Vargas E, Riccio PM, Hachinski V. Diagnosis of atrial fibrillation after stroke and transient ischaemic attack: a systematic review and meta-analysis. Lancet Neurol. 2015;14(4):377-87.
11. McMurray JJ, Adamopoulos S, Anker SD, et al. ESC Committee for Practice Guidelines. ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. Eur J Heart Fail. 2012;(8):803-69.
12. Oudejans I, Mosterd A, Bloemen JA, Valk MJ, van Velzen E, Wielders, JP et al. Clinical evaluation of geriatric outpatients with suspected heart failure: value of symptoms, signs, and additional tests. Eur J Heart Fail 2011;13:518-527.
13. Edholm K, Ragle N, Rondina MT Antithrombotic management of atrial fibrillation the elderly. Med Clin North Am. 2015;99(2):417-30.
14. Rosero SZ, Kutyifa V, Olshansky B, Zareba W. Ambulatory ECG monitoring in atrial fibrillation management. Prog Cardiovasc Dis. 2013;56(2):143-52.
15. Pop D, Zdrenghea D. Monitorizarea ECG Holter. Clusium; 2014.
16. Ritter P. Holter in monitoring of cardiac pacing. Prog Cardiovasc Dis. 2013;56(2):211-23
17. Greene HL. Clinical significance and management of arrhythmias in the heart failure patient. Clin Cardiol. 1992;15 Suppl 1:I13-21.
18. Deedwania PC. Silent myocardial ischaemia in the elderly. Drugs Aging. 2000;16(5):381-9.
19. Wimmer NJ, Scirica BM, Stone PH. The clinical significance of continuous ECG (ambulatory ECG or Holter) monitoring of the ST-segment to evaluate ischemia: a review. Prog Cardiovasc Dis. 2013;56(2):195-202.
20. Elmståhl S, Furuäng L. Ambulatory recorded ST segment depression on ECG is associated with lower cognitive function in healthy elderly men. Int J Gen Med. 2009;2:145-51.
21. Rodriguez RD, Schocken DD. Update on sick sinus syndrome, a cardiac disorder of aging. Geriatrics. 1990 Jan; 45(1):26-30,33-6.
22. Lakatta EG. So! What's aging? Is cardiovascular aging a disease? J Mol Cell Cardiol. 2015;83:1-13.