CARDIAC AND RENAL DAMAGE IN ELDERLY TREATED HYPERTENSIVE PATIENTS WITH MASKED UNCONTROLLED HYPERTENSION

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ABSTRACT

Introduction: Talking about organ damage in elderly patients with uncontrolled hypertension means talking about cardiac or renal organ damage among those who have sustained uncontrolled hypertension (SUH) and also controlled hypertension (CH) after performing only clinical measurements of the blood pressure (BP), but once we use ambulatory blood pressure monitoring (ABPM) we can discus also about organ damage in masked effect on uncontrolled hypertension (MEUH) especially cardiac damage [1-3]. What about renal damage in elderly patients with MEUH? **Objectives:** Our study aims to determine the presence of cardiac and renal damage in elderly patients with MEUH and the impact on BP parameters after performing ABPM. Material and Methods: We have carried out a cross-sectional study of 190 elderly hypertensive patients with uncontrolled hypertension for more than a year. For gathering hypertension profiles and BP parameters ABPM was performed. Electrocardiography (ECG) was done to identify the presence of cardiac damage and Urinary Albumin Creatinine Ratio (UACR) was calculated for establishing the presence of renal damage. The obtained data were statistically analyzed, and the results were expressed as descriptive and correlational data. **Results:** We identified that MEUH was the third BP profile as important after SUH and CH with 24.2% of the cases. Moreover, LVH and UACR were identified in more than half of the cases with a p-value <0.001, respectively 0.05. **Conclusion:** We managed to show that MEUH is related to cardiac and renal damage. which may be a burden in elderly patients with uncontrolled hypertension.

Keywords: masked uncontrolled hypertension, cardiac damage, renal damage.

INTRODUCTION

Because the prevalence of hypertension in elderly patients lifts to more than 50% [4], ABPM is required as the first technique used in the general practitioner office for the monitorization of BP parameters, establishing the correct BP profile and the correct control rate of the treatment which will improve patient's quality of life [4-6]. BP profiles like SUH and CH were related to a very high mortality rate in association with target organ damage [4].

In other studies, MEUH profile is seen as the second high-risk group, after SUH, with a greater risk of developing organ damage and cardiovascular events than white coat effect on uncontrolled hypertension (WCEUH) profile [1,7]. Also in treated elderly hypertensive patients with uncontrolled hypertension, it is well known that the ten years mortality rate is higher in those with MEUH than in those with CH or with WCEUH [2] which requires intensive care and good monitorization of the treatment, BP parameters, and related organ damage.

Uncontrolled hypertension leads to organ damage such as cardiac damage expressed as LVH on ECG or renal damage expressed as high values of UACR, both of which contribute to an increase in all-cause mortality rate [2,6,8,9]. Knowing that LVH on ECG is associated with high UACR in hypertensives patients, independent of age and SBP [10] and also that both LVH and UACR are related to uncontrolled hypertension [2,6,8] cardiac and renal damage seems to be strongly related between them and with uncontrolled hypertension leading to a raised mortality rate[6-8,10].

The prevalence of target organ damage is still higher even in treated elderly hypertensive patients, especially in those with SUH or CH [11], therefore this study aimed to show if the prevalence of cardiac and renal organ damage in MEUH compared to CH has the same impact on the BP profile and BP parameters obtained after performing ABPM.

MATERIALS AND METHODS

We conducted a cross-sectional study of 190 treated elderly hypertensive patients. Subjects were gathered, for a year, from general practitioner database. The inclusion criteria were: treated hypertensives patients for at least one year, age 65 years or older, with optimal ABPM (more than 70% of the measurements valid, and at least 23 hours of recording).

The study was approved by the Ethics Committee of the University of Medicine and Pharmacy Victor

Babes Timisoara. At the beginning of the study, all participants gave their informed consent.

For gathering data all patients performed clinic blood pressure measurements, followed by ABPM. After performing ABPM BP profiles were established as follows: CH — normal clinic BP and normal ABPM values; WCEUH — elevated clinic BP and normal ABPM values; MEUH — normal clinic BP but elevated ABPM values; SUH — elevated clinic BP and elevated ABPM values [12]. Also, BP parameters such as 24h, daytime, and nighttime systolic (SBP), diastolic (DBP), and pulse pressure (PP) were pointed out.

Cardiac damage was defined as the presence of LVH on ECG by the criteria of index Sokolow-Lyon normal and modified, and index Cornell normal and modified [5]. Renal damage was defined as elevated UACR (≥30mg/g) after the biochemical analysis was done [8].

The obtained data were statistically analyzed with SPSS version 20, at a significant level of <0.05 for the p-value. Continuous variables were reported in descriptive statistics as mean and SD and categorical variables as frequency and percentage. To express the differences between the BP pattern was used Pearson chi-square test with the interpretation of the Likelihood Ratio and One Way-ANOVA..

RESULTS

One hundred and ninety elderly treated hypertensive subjects aged 65 years or older met the inclusion criteria in the study. BP profiles had the following distribution: SUH 36.8%> CH 27.4%> MEUH 24.2%> WCEUH 11.6%.

Baseline characteristics of the subject included in the study are mean age 74.13±5.87; from the urban area 71.1%; gender - female 53.2%; smoking status - past smoker 43.2%; alcohol consumption - occasional drinker 44.2%. The characteristics of each group of the study, meaning CH, WCEUH, MEUH, SUH, are pointed out in Table 1.

In MEUH profile the frequent smoking status is smoker 34.8% and the frequent alcohol consumption category is non-drinker 43.5%.

Cardiac and renal organ damage within the study groups is represented in Table 2. The prevalence of LVH in the study group is 64.2% having the following distribution among the groups: SUH> MEUH> CH> WCEUH. The prevalence of high values of UACR in the study group is 54.7% with the following distribution among the groups: SUH> MEUH> CH> WCEUH.

Characteristics of the presence of the cardiac and renal damage in MEUH versus CH group are pointed out in Table 3. Cardiac damage was identified in 15.8% of the total in MEUH profile and 14.7% from the total in CH profile. For each of the BP parameters, LVH had a p-value of <0.01. Renal damage was identified in 13.7% from the total in MEUH profile and 12.1% from the total

for CH profile. For each of the BP parameters, UACR had a p-value of <0.01.

		Hypertension pattern				
		CH	WCEUH	MEUH	SUH	
		N=52	N=22	N=46	N=70	p-value
Gender	Female	55.8%	45.5%	50.0%	55.7%	0.793
Zone	Urban	71.2%	54.5%	78.3%	71.4%	0.253
Smoking status	Past-smoker	51.9%	40.9%	30.4%	45.7%	0.346
Alcohol consumption	Occasional-drinker	51.9%	40.9%	34.8%	45.7%	0.265

Note. Statistical test used-Pearson Chi-Square with p<0.05.

Table 1
Baseline characteristics of the study groups

	Hypertension pattern					
	CH	WCEUH	MEUH	SUH	Total	
	n=52	n=22	n=46	n=70	n=190	p-value
Left ventricular hypertrophy	53.8%	31.8%	65.2%	81.4%	64.2%	<0.001
Albumin Creatinine Ratio	44.2%	31.8%	56.5%	68.6%	54.7%	0.005

Note: Statistical test used: Chi-square test, Likelihood Ratio test with p-value<0.05.

Table 2
Hypertension profiles and organ damage

	LVH			UACR		
	CH n=28	MEUH, n=30	p value	CH n=23	MEUH, n=26	p value
Clinic SBP, mmHg	122.92±8.91	129.33±4.82	<0.001	121.91±8.02	128.92±5.05	<0.001
Clinic DBP, mmHg	68.28±4.21	76.82±7.97	<0.001	68.04±4.02	75.94±8.22	<0.001
Clinic PP, mmHg	54.64±5.56	52.51±7.16	<0.001	53.86±5.06	52.97±7.59	<0.001
ABPM 24h SBP, mmHg	119.03±1.69	142.42±6.11	<0.001	118.79±1.58	142.62±6.55	<0.001
ABPM 24h DBP, mmHg	71.29±2.18	87.56±1.19	<0.001	71.08±2.05	87.54±1.28	<0.001
ABPM 24h PP, mmHg	47.74±0.81	54.85±5.06	<0.001	47.71±0.81	55.07±5.41	<0.001
ABPM Daytime SBP, mmHg	120.43±1.32	145.21±7.13	<0.001	120.22±1.23	145.61±7.57	<0.001
ABPM Daytime DBP, mmHg	72.17±1.94	88.72±1.50	<0.001	72.00±1.87	88.78±1.57	<0.001
ABPM Daytime PP, mmHg	48.26±1.29	56.48±5.98	<0.001	48.21±1.26	56.82±6.32	<0.001
ABPM Nighttime SBP, mmHg	113.77±4.32	131.23±5.54	<0.001	113.42±4.21	130.61±5.33	<0.001
ABPM Nighttime DBP, mmHg	67.98±4.57	83.19±2.26	<0.001	67.61±4.47	82.90±1.96	<0.001
ABPM Nighttime PP, mmHg	45.78±3.57	48.04±6.07	<0.001	45.80±3.55	47.70±5.69	<0.001

Note. Statistical test used-ANOVA Chi-Square with p value<0.05

Table 3
Characteristics of the presence of organ damage between BP profiles

DISCUSSION:

According to the findings in our study such as the characteristics of the subjects from MEUH BP profile in comparison with CH profile we can say that the frequent smoking status as smoker, increases the total risk of the group turning it into a high-risk group if we take into account the prevalence of cardiac damage among this group. Same results were gathered by Naser et al. [1] in their study with a final conclusion that BP control needs to be improved in order to reduce overall risk and increase patients' quality of life.

The second BP profile according to the prevalence distribution in the group is MEUH, which represents a higher overall risk than CH profile, and so a greater reason for using ABPM in the management of hypertension cases, like said before in other studies [5,6,13,14].

Also, MEUH has the greatest prevalence of LVH and UACR after SUH, which means that we can find cardiac and renal damage more often in patients with MEUH than in patients with CH, emphasizing the need for using ABPM for the accurate and correct determination of BP patterns. This idea was sustained by others in their studies in order to reduce the high mortality risk in MEUH patients and improve quality of life [3,15-17].

If we discuss about the impact of cardiac damage we can say firstly that it is greater on MEUH than CH profile ($p<0.001$) and secondly that it is also very significant related to all BP parameters obtained after performing ABPM. The same impact on the BP parameters has renal damage ($p<0.001$) but we have to specify that the overall impact on MEUH profile is not as significant ($p=0.05$) as for cardiac damage ($p<0.001$). In other studies, MEUH was related to adverse cardiovascular and renal outcomes [18,19]. Furthermore in a study, the renal damage was even more important than the cardiac damage for MEUH profile [8]. Many studies conclude that MEUH is the second profile when it comes to discussions about cardiac and renal damage, and all studies recommend ABPM as the gold standard technique in the management of hypertension cases [2,3,5].

We managed to show that cardiac damage and renal damage had the same impact ($p<0.001$) on BP parameters of MEUH versus CH profile, such as those obtained by clinical measurements (Clinic - SBP, DBP and PP) as well for those obtained by ABPM measurements (ABPM 24h – SBP, DBP, PP; ABPM Daytime – SBP, DBP, PP; and ABPM Nighttime – SBP, DBP, PP) because prevalence of LVH in MEUH respectively prevalence of UACR in MEUH were both higher than those for CH, meaning that this BP profile is more related to cardiac and renal organ damage, having a high adverse prognosis in the elderly, so we should better monitor all BP parameters and control the patient's treatment if we want to reduce the overall risk. The impact of cardiac damage on MEUH vs CH profile was the same in Pierdomenico et al. study [2] also showing that clinic SBP, ABPM 24 SBP, Daytime SBP, and Nighttime SBP are significantly related to increased cardiovascular risk. The impact of renal damage on MEUH profile was very strong as said by Agarwal [8] and Drawz et al. [19] suggesting that this BP profile has a raised over-all risk which becomes higher in

association with the presence of LVH. In LIFE study [20] the relation between the presence of LVH and increased UACR was shown as follows: LVH on ECG is associated with increased prevalence of UACR which determines a raised mortality and morbidity rate. Therefore we have to identify as soon as possible MEUH profile regarding the fact that this BP profile, as we managed to show, is related to both cardiac and renal damage which will affect the quality of life of the patients.

CONCLUSION:

In elderly treated uncontrolled hypertensive patients MEUH is the second important BP profile after SUH in terms of affecting patients' quality of life, because of the presence of cardiac and renal organ damage. Renal organ damage has approximately the same impact on BP parameters as cardiac damage and so we can conclude that when it comes to MEUH besides investigating cardiac damage we have to include also renal impairment investigations in the management of case of hypertensive patients.

Conflicts of Interest: No conflicts of interest.

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