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Research Article

24-Hour Electrocardiographic (ECG) Holter Recording during Hypertensive Cardiopathy in Health Facilities in Lome

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ARTICLE INFO

Article history:
Received: 21 January, 2022
Accepted: 5 February, 2022
Published: 25 February, 2022

Keywords:
Hypertensive heart disease
standard ECG
Holter ECG
Togo

ABSTRACT

Objective: To evaluate the 24-hour Holter ECG recording in hypertensive heart disease.

Methods: This was a descriptive and analytical cross-sectional study on files of patients with hypertensive heart disease, carried out from October 2016 to October 2019, in two health facilities in Lome (TOGO). Electrical left ventricular hypertrophy (LVH) was defined by the Sokolow-Lyon and Cornell indices. On echocardiography, the HVG according to the criteria of the American Society of Echocardiography, was the characteristic retained for a CH. Holter-ECG recordings were carried out over 24 hours by two Holter devices.

Results: 107 patients were included, with a sex ratio of 1.89 (M / F). The mean age was 62.2 ± 12 years. The mean duration of the evolution of hypertension was 10.8 ± 9.1 years. On standard ECG, arrhythmias were more frequent (32.6%) with ACFA in 5.6% of cases. The prevalence of echocardiographic HVG was 74.8%, predominantly concentric, and was significantly found in hypertensive patients over 10 years of age. During the 24-hour Holter ECG recording, ACFA was the common arrhythmia (30%), episodic in 90.6% of cases and permanent 9.4% and was statistically associated with OG size, sex and age. The Holter ECG detected sustained ventricular tachycardia in 7 patients (6.5%). The Recording was normal 12.1% of the time.

Conclusion: Hypertensive heart disease is the first of the cardiac complications of hypertension. The Holter ECG is a tool for the detection of fatal severe paroxysmal events that go unnoticed on the surface ECG such as AC/AF, sustained ventricular tachycardias.

Introduction

Cardiac damage during high blood pressure (hypertension) is referred to as hypertensive cardiopathies (HC). Presentations of HC are diverse, ranging from increased left ventricular mass called hypertrophy and / or asymptomatic left atrium (LA) dilatation to true heart failure (HF) with preserved systolic function [1]. Left ventricular hypertrophy (LVH) is the first detectable marker of the cardiac repercussions of hypertension, objectified by the electrocardiogram (ECG) or cardiac echocardiography and constitutes an infra-clinical cardiac damage known as target organ damage [2]. The LVH induced by hypertension favours the occurrence of silent ischaemia, conduction disorders and arrhythmias especially ventricular arrhythmias, which are a frequent source of sudden death [2, 3]. Atrial arrhythmias entail a double risk: hemodynamic by chronic or paroxysmal HF such as acute pulmonary edema (APE) and systemic embolic [2]. These rhythm and conduction disorders are on one hand secondary to the infra-clinical cardiac damage of hypertension and are therefore unrecognized, and on the other hand, they are often paroxysmal and therefore fleeting disorders. This work therefore proposes to evaluate the 24-hour Holter ECG recording during HC in order to highlight these fleeting rhythm disorders in hypertensive patients.

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http://dx.doi.org/10.31487/j.JICOA.2022.01.01

Materials and Methods

This was a descriptive and analytical cross-sectional study, on files of patients with HC, conducted over a period of three years, from October 2016 to October 2019, in two health structures in Lomé (Togo). We included in this study the files of patients with HC discovered on a cardiac echo Doppler, whether symptomatic or not and having benefited from a Holter ECG recording, a minimum WHO assessment of the 'HTA with measurement of calcium and magnesemia. The records of patients with cardiac damage of other origin (diabetes, ischaemia, infectious, toxic, renal failure) were not included. Records of patients with HC who subsequently acquired associated cardiac damage of other origin (diabetes, ischaemia, infectious, toxic, renal failure) were not retained. None of the patients were high-level athletes. Electrically, LVH was defined by a Sokolov-Lyon index (SV1 + RV5 or V6)> 35 mm and / or a Cornell index (SV3 + RavL)> 28 mm in men and> 20 mm in women; Left atrial hypertrophy (LAH) was defined by an elongated sinus P wave with a duration ≥ 120 ms and/or a P wave with strong negative polarity in V1 [4]. Echocardiographically: LVH was defined by the American Society of Echocardiography criteria (left ventricular mass indexed to body surface area ≥ 115 g/m^2 in men / 95 g/m^2 in women) [5]. Relative parietal thickness (RPT) was normal for a value < 0.42 [5]. The different types of LVH were those defined according to Ganau and Devereux [6]. Left ventricular diastolic dysfunction was defined according to the mitral profile: grade 1 or relaxation disorder (Em / Am ≤ 0.8), grade 2-normal or pseudo-normal (0.8 <Em / Am <2), grade 3 or restrictive (Em / Am ≥ 2) or by the Em / Ea ratio ≥14 associated with LA dilatation (Ea = protodiastolic myocardial wave at the mitral annulus) [5]. The LA was dilated for an area greater than 20 cm^2 or indexed LA volume ≥ 34ml [5, 7]. Left ventricular systolic dysfunction was defined as LV ejection fraction (LVEF) lowered to less than 50% [5]. Holter recording was performed over a 24 hour period by two devices equipped with HoltersoftUltima v2.6.0 computer analysis software and Darwin analysis software. All Holter-ECG recordings were interpreted by cardiologists. We used the LOWN classification of arrhythmias and the 24-hour Holter ECG recording normality criteria [8].

Data Processing and Analysis

Text entry and processing were performed using Microsoft Word Office 2016 software. Our data were analysed using EPI INFO software version 7.2.1.0. Tables were completed using Microsoft Word 2016 and Microsoft Excel 2016 software. Qualitative parameters were presented as counts followed by percentage. Quantitative parameters were presented as mean ± standard deviation or median ± interquartile range (IQR). The Chi-square test was used to compare proportions and Student's t test was used to compare the means. The p <0.05 was the threshold for statistical significance of the variables.

Results

I Epidemiological and Clinical Data

A total of 107 patient files were retained with a M / F sex ratio of 1.89. The mean age of the patients was 62.2 ± 12 years. The most represented age group was between 60 and 74 years. The mean duration of the evolution of hypertension was 10.8 ± 9.1 years. More than half of the patients (63.6%) had been hypertensive for at least 10 years. More than three quarters of the patients knew they were hypertensive and were on treatment. The mean systolic blood pressure (SBP) was 142.5 ± 20.5 mmHg with extremes of 102 and 216 mmHg. The mean diastolic blood pressure (DBP) was 82.6 ± 15.5 mmHg.

II Echocardiography Data

The prevalence of echographic LVH was 74.8% and was concentric in 61% of cases. An abnormality of left ventricular relaxation was found in 67% of cases (Table 1). LVH was significantly more found in hypertensive patients with more than 10 years of history of hypertension (OR: 2, 95% CI 1.13-5.76, P = 0.002). Patients with SBP ≥ 140 mmHg had 3.6 times the risk of developing LVH (OR: 3.6, 95% CI 1.13-9.76, P = 0.0092). The mean LA area was 18.6 ± 5.4 cm^2 and LA dilatation was noted in 31% of cases.

Table 1: Holter electrocardiography abnormalities.

	Number (n)	Percentage (%)
Troubles de rythme		
Ventricular extrasystole	87	80.4
Classe 0 de Lown	20	18.7
Classe I de Lown	65	58.8
Classe II de Lown	05	04.7
Classe III de Lown	11	10.3
Classe IV de Lown	08	7.4
Classe V de Lown	00	00
Ventricular tachycardia	07	6.5
Atrial fibrillation	32	30
Atrial extrasystole	12	11.2
Atrial flutter	02	1.8
Conduction disorders		
Atrio-ventricular block	09	8.4
Sino-atrial block	03	1.8
Sinus variability alteration	05	4.7

III Standard ECG Data

LAH was found in 32.7% of cases and LVH in 34.6% of cases. Atrial and ventricular extrasystoles were present in 10.3% and 10.3%, respectively. Cardiac arrhythmia by atrial fibrillation CA/AF was noted in 5.6%. Table 2 shows the frequency of electrocardiographic abnormalities.

Table 2: Standard electrocardiography abnormalities.

	Number (n)	Percentage (%)
Conduction disorders	48	44.8
Sinus bradycardia	16	14.9
Anterieur hemiblock	13	12.6
Right bundle brunch block	10	9.4
Atrio-ventricular block	7	6.5
Left bundle brunch block	2	1.8
Left ventricular hypertrophy	35	34.6
Left atrial hypertrophy	34	32.7
Arrhythmias	34	32.7
Ventriculaires extrasystoles	11	10.3
Atrials extrasystoles	11	10.3
Atrial fibrillation	06	5.6
Sinus tachycardia	04	3.7
Atrial flutter	02	1.8
Ischaemia	18	16.8
QS aspect	10	9.4
Left axis	8	7.5

IV Holter ECG Data

On the Holter ECG, rhythm disorders were the most common abnormalities in 89% of cases, conductive disorders were rare. At the atrial stage, AESs were present in 11.2%. The occurrence of CAAF was noted in 30% and was statistically associated with LA dilatation (OR = 2.3, 95% CI: 4.5-6.5, p = 0.0061), as much as with age greater than 60 years (OR = 1.1, 95% CI: 0.1- 2.2, p = 0.0024), but not with sex (p=0.87). At the ventricular stage, VESs were present in 80.4% including 10.3% and 7.4% respectively of class 3 and 4 of the Lown classification. These VESs were statically significantly associated with LVH (OR: 2.4, 95% CI 1.1-8.6, P = 0.002). Ventricular tachycardia (VT) was observed in 7 cases (6.5%). The occurrence of VT was statistically associated with LVH (OR = 1.2, 95% CI: 1.9-5.1, p = 0.04). Table 1 shows the frequency of electrocardiographic abnormalities on Holter ECG.

V Comparative Data of Standard ECG and Holter ECG

The frequency of extrasystoles found on Holter ECG was high compared to standard ECG and was statistically insignificant for AES (p = 0.83) but highly significant for VES (p = 0.0001). The Holter ECG revealed CA/AF in 32 patients (30%) and was episodic in 90.6% of cases and was present throughout the recording in 9.4% of cases with a statistically significant difference from the standard ECG. Atrial flutter was observed in 1.8% of recordings (2 cases) as was VT in 7 patients (6.5%). These two rhythm disorders were not present on the standard ECG. VESs were 8 times more numerous on Holter (Table 3).

Table 3: Comparison of abnormalities found on Holter ECG and standard ECG.

Anomalies	Holter ECG n (%)	Standard ECG n (%)	p
Arrhythmias			
Atrial extrasystole	12 (11.2)	11 (10.3)	0.8321
Atrial fibrillation	32 (30)	6 (5.6)	< 0,0001
Atrial flutter	02 (1.8)	02 (1.8)	-
Ventricular extrasystole	87 (80.4)	11 (10.3)	< 0.0001
Ventricular tachycardia	07 (6.5)	00	0.0141
Conduction disorders			
Atrio-ventricular block	09 (8.4)	7 (6.5)	0.5975
Sino-atrial block	03 (1.8)	00	0.2464

Discussion

I Left Ventricular Hypertrophy in the Black Race

Hypertensive subjects of the continent are relatively young and present very early the complications among which the HC [9, 10, 11]. We report a prevalence of LVH of 34.6%. Higher prevalence of electrical LVH have been reported in Africa by Opadijo (50%) in Nigeria and Lépira (53.3%) in Congo [12, 13] . However, our data are higher than those described in the European literature. Lozano in Spain, in a study of 15798 hypertensive patients aged 55 and older, found a prevalence of 20.3% of LVH [14]. We note that in the West, despite a large sample

size and yet taking into account elderly people, the rate of LVH remains lower than the prevalence in the black African population. We incriminate the delays in diagnosis and management of hypertension in our country, the rapidity of complications of hypertension in black subjects and the genetic factor, because naturally, LVH is more frequent in black hypertensive patients [11].

At cardiac echo Doppler, the high frequency of echographic LVH in our sample is superimposed on those reported by Sha *et al*. (65.8%) [15]. Jaleta in Ethiopia and Ikama in Congo reported a prevalence of LVH of 52% and 47.9% respectively [16, 17]. These figures reflect the high frequency of echographic LVH in the black hypertensive subject. A Framingham study of 4970 hypertensive patients reported a superiority of LVH in black African hypertensive patients, indicating a particular predisposition related to genetic and racial factors [18].

II Holter ECG Data in Hypertensive Heart Disease

Holter ECG recording is not used in routine practice in hypertensive patients, which makes the data in the literature of this examination during HC poor. The Holter ECG has been used in our work to find potentially serious and fatal rhythm disorders.

At the atrial stage, we reported 30% CA/AF with Holter recordings. Saar *et al*. in Senegal in their study of 208 hypertensive patients reported 6 cases of paroxysmal atrial fibrillation on standard ECG [9]. It is clear that the figures reported with standard ECG recordings are far below reality. It would be better to have Holter ECG performed in hypertensive patients with the above-mentioned CA / AF risk factors, in particular the size of the LA, the age greater than 60 years and a duration of evolution of hypertension greater than 10 years.

At the ventricular stage, Holter recording revealed one of the most rapidly fatal heart rhythm disorders. This is ventricular tachycardia (VT). The latter is known to be the cause of sudden death, especially in coronary patients or during dilated cardiomyopathy (DCM) [19]. We found 7 cases (6.5%) of VT significantly related to LV diastolic dysfunction and LVH. The presence of VT in a hypertensive patient without cavitary dilatation should raise suspicion of an association with silent or non-silent ischaemic heart disease. We believe that the elevation of filling pressures on the one hand and the presence of possible fibrosis within the parietal hypertrophy on the other hand could explain these severe ventricular rhythm disorders. Severe LVH is often associated with discrete ST segment sub-levels ("strain") and biphasic or even negative T waves [20]. ST segment sub-levels in patients with LVH represent signs of subendocardial ischaemia and have a poor prognosis [20]. Whatever the case, the discovery of a VT in a hypertensive patient should be the subject of an indication for myocardial scintigraphy and if possible coronary angiography. Also, certain symptoms or signs such as unexplained syncope or faintness should make one think of this VT in hypertensive patients.

Holter ECG recording also allowed us to note disorders of ventricular excitability with malignant features in 17.7% of patients. These VESs are not only the anti-chamber of VT but may also aggravate diastolic dysfunction or lead to a true associated rhythmic heart disease. Conduction disorders appear to be rare in uncomplicated HC.

III Risk Factors Associated with Cardiac Rhythm Disorders in Hypertensive Heart Disease

The Holter ECG is therefore a useful examination in the evaluation of the symptomatic hypertensive patient in order to determine potentially serious rhythm disorders. The factors that should lead to a search for serious rhythm disorders in HC are epidemiologically: a duration of 10 years and more of hypertension, an average age of 60 years; clinically: unexplained dyspnea, syncope or lipothymia of palpitations, unexplained TIA or ICVA; at the ECG level: numerous VESs, whether symptomatic or not; echocardiographically: LA dilatation greater than or equal to 20 cm^2 or a diastolic dysfunction of the LV.

Conclusion

Hypertensive cardiopathy (HC) is the first of the cardiac complications of hypertension. Atrial and ventricular extrasystoles are frequent in HC and sometimes with a pejorative character are detected by the Holter ECG. Complete arrhythmia by atrial fibrillation (CA/AF) is the most common atrial rhythm disorder found paroxysmally and fleetingly in HC. These disorders are rarely present on standard ECGs but are highlighted by Holter recording. The latter allows the detection of potentially fatal disorders such as ventricular tachycardia during HC. The Holter ECG is therefore a useful examination in the evaluation of the patient with symptomatic or non-symptomatic HC in order to determine potentially serious rhythm disorders absent on standard ECGs.

Ethical Statement

Confidentiality of the data was ensured by restricted access to the files and by respecting anonymity.

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