SCREENNING OF ARRHYTHMIAS IN PATIENTS TREATED FOR HEART FAILURE IN PARAKOU IN 2017

Abstract

Introduction: Rhythm disorders (RDs) or arrhythmias are poor prognostic factors during heart failure (HF). Our objective was to study the frequency of rhythm disorders presented by patients treated for HF in Parakou, Benin in 2017.

Methods: This was a cross-sectional, descriptive and analytical study. It consisted of a systematic recruitment of all patients admitted for heart failure in the cardiology units of the city of Parakou from March to August 2017. The diagnosis of RDs was made by cardiac auscultation completed by electrocardiographic recording (standard and Holter over 24 hours). The Lown classification was used to describe the severity of ventricular TRs. The threshold for significance was $p < 5\%$.

Results: A total of 83 heart failure patients aged 61.47 ± 15.97 years with a sex ratio of 1.08 were selected. Arrhythmia was detected by auscultation in 20.48%; by standard electrocardiogram (ECG) in 25.83% and by Holter ECG in 97.59% of patients. Among the arrhythmias detected by Holter ECG, 81.48% were atrial, including 28.79% of atrial fibrillation. RDs was ventricular in 90.12% of which 47.95% were severe. Left ventricular systolic dysfunction was significantly associated with ventricular arrhythmias. On the other hand, the frequency of ventricular arrhythmias was not associated with the severity of the HF according to the NYHA classification.

Conclusion: In Parakou, RDs are frequent in patients with HF. Holter ECG should be included in the follow-up of heart failure patients in order to improve their management.

Key words : Heart failure - rhythm disorders - Holter ECG ~~– Benin~~.

Introduction

Heart failure (HF) is a major public health problem in industrialized countries [1]. It is a frequent and severe disease in Africa [2]. Studies have shown that half of symptomatic heart failure patients die within for years and that among

patients with severe heart failure, more than 50% die within the first year [3]. A retrospective study performed in Parakou, Benin, in 2016, on the evolutionary and prognostic aspects of HF estimated its lethality at one year at 37.21% and the main evolutionary complication was represented by rhythm disorders (RDs) [4]. A re-evaluation in 2020, despite the improvement of the management by the use of beta-blockers and the sensitization on hygienic and dietetic measures and medical follow-up, found a lethality of 30.37% with an arrhythmia as a complication in 8.32% of cases [5].The occurrence of a TR modifies the evolution of the HF [6]. Some RDs, especially supraventricular ones, favor cardiac decompensation [7]. In Morocco in 2010, complete atrial fibrillation arrhythmia (CAFA) was responsible for the decompensations of the HF and represented a factor of bad prognosis [8]. Similarly, ventricular RDs are considered poor prognostic factors as they are the leading cause of sudden death in HF [9].

The objective of this work was to study RDs in patients with HF treated Parakou in 2017.

Methods

Study setting : our study took place in the cardiology units of the two reference hospitals in Parakou: the University and Departmental Hospital Center and the Hospital of Instruction of the Armies.

Study method : this was a cross-sectional, descriptive and analytical study with prospective data collection. It included all heart failure patients received in consultation or hospitalized over the period from March 6, 2017, to August 6, 2017. We had included patients aged at least 18 years, seen for HF, having given their informed consent and able to stay at least twenty-four (24) hours in the city of Parakou for ECG Holter recording. Parkinsonian patients and patients with psychiatric disorders were not included.

The dependent variable was the presence of at least one of the following RDs observed on standard ECG and/or Holter ECG. These were atrial RDs (atrial flutter; atrial fibrillation; atrial extrasystole; atrial tachycardia), junctional RDs (junctional extrasystole; junctional tachycardia), and ventricular RDs (ventricular extrasystole; ventricular tachycardia; ventricular fibrillation; tip twist). The diagnosis of RDs was made on the basis of the following electrocardiographic criteria:

With regard to supraventricular RDs [9,10]

- Atrial fibrillation (AF): Absence of P waves replaced by a tremor of the baseline with fine and irregular QRS complexes.

- Atrial flutter: Regular rapid atrial activity between 250 and 350 bpm, with no clear return to baseline, giving a jagged appearance with usually fine, rapid and regular QRS complexes.

- Atrial tachycardia: Regular fine QRS tachycardia with a frequency between 100 and 250 bpm. The P waves are of abnormal morphology but well individualized and separated by a return to the isoelectric line. The atrio-ventricular conduction is variable and the aspects of functional atrio-ventricular block 2/1, 3/1 are evocative.

- Junctional tachycardia: Tachycardia with very regular fine QRS complexes, frequency between 130 and 260 bpm with absence of P waves preceding the QRS complexes or negative retrograde P waves in D2, D3, aVf.

- Atrial extrasystole: Premature P wave with a morphology generally different from the sinus P wave accompanied by a normal QRS complex.

A supraventricular rhythm disorder has been considered severe when any of the following conditions were present:

- supraventricular extrasystoles >10/24h from age 20 to 40 years or >100/24h from age 40 to 60 years;

- bursts of supraventricular extrasystoles present before age 50 or >2 bursts of 10 complexes after age 50 ;

- Presence of atrial fibrillation or atrial flutter.

With regard to ventricular rhythm disorders [10, 11, 12]

- Ventricular tachycardia (VT): Succession of at least 3 wide QRS with T waves of opposite axis to the QRS and disappearance of the ST segment following each other at a regular frequency >100 bpm with atrioventricular dissociation, i.e., the number of P waves is less than that of the QRS complexes.

- Ventricular fibrillation (VF): Tachycardia >350 bpm with disappearance of any structured ventricular electrical deflection, replaced by irregular more or less ample oscillations of the baseline with spindles.

- Twisttip (TP): Tachycardia between 160 and 280 bpm. The deflections are more organized than in VF, with spindle images (with a belly and nodes); they

often change direction at the level of the belly (sometimes pointing up, sometimes pointing down) and always occur on an evocative abnormality: it is the marked prolongation of the QT space greater than 0.60 seconds.

- Ventricular extrasystoles (VSE): premature beats with wide QRS complexes not preceded by P waves, different from the QRS complexes in sinus rhythm; the QRS complex is immediately followed by a T wave of opposite axis to the widened QRS complex without visible ST segment.

The severity of VSEs was assessed according to the Lown classification [13].

Class I: monomorphic VSE <1/min or <30/h

Class II: monomorphic VSEs >1/min or >30/h

Class III: polymorphic VSEs

Class IV A: Doublet VSEs

Class IV B: Bursts of at least three VSEs

Class V: early VSE with R/T phenomenon.

Classes IV and V are considered severe.

Other variables studied were: sociodemographic and economic data (age, sex, ethnicity, religion, occupation, marital status, educational level, place of residence, socioeconomic level), cardiovascular risk factors (smoking, excessive alcohol consumption, hypertension, type 2 diabetes, obesity), family history of cardiovascular events, early stroke (before 45 years of age), personal history of cardiovascular disease (stroke, cardiomyopathy, coronary insufficiency, deep vein thrombosis, pulmonary embolism, valvulopathy), characteristics of heart failure (functional stages, evolutionary mode, systolic function, diastolic function, etiology, type of treatment, and therapeutic compliance), and biological abnormalities (kalemia, calcemia, and magnesemia).

All of these data were collected, after obtaining the patient's consent in consultation or in hospital, by means of an interview using a questionnaire, the physical examination, and the electrocardiographic recordings. The standard ECG was performed with a Biocare 6-channel ECG 300G electrocardiograph, and the Holter ECG recordings were performed over 24 hours with a Schiller MT-101 platform.

The data collected were recorded, processed, and analyzed using Epi Data 3.1 and Epi info 7.2.0.1 software, respectively. Quantitative variables were expressed as mean ± standard deviation while qualitative variables were expressed as proportions with their 95% confidence intervals. Comparison of proportions was performed with the Chi 2 test or Fisher's exact test as appropriate. Thus, an association between the different variables and RDs was sought. For these comparisons, a p probability < 0.05 was considered statistically significant.

Administrative considerations

Our work was done in strict compliance with ethical standards and hierarchical rules. Informed consent was obtained from the patients before any data collection. Confidentiality of the collected data was ensured. Any patient detected with RDs was referred to a cardiologist for readjustment of treatment.

Results

Our study included 83 patients admitted for heart failure at the University and Departmental Hospital Center and the Hospital of Instruction of the Armies in Parakou, Benin.

General characteristics of patients

~~In the sample~~, 43 (51.81%) male and 40 (48.19%) female patients were included in the study. The sex ratio was 1.08. The mean age of the patients was 61.47 ± 15.97 years with a median of 62 years and extremes of 23 and 90 years. The most represented age group was 50 to 69 years (49.40%). 68.67% of the surveyed subjects were hypertensive, 14.46% were diabetic and 21.69% were obese. Nearly half (48.19%) were in NYHA stages III or IV and dyspnea was the most common symptom (98.80%), followed by asthenia (55.42%) and palpitations (27.71%). Systolic dysfunction was present in 75% of patients.

Arrhythmia Study

A total of 81 patients (97.59%) had a diagnosed arrhythmia by at least one of the diagnostic means used. Auscultatory arrhythmia was present in 17 patients (20.48%). On standard ECG, 21 patients (25.83%) had a RD and 81 patients (97.59%) had a RD on Holter ECG.

Among the RDs found on standard ECG, 10 cases showed supraventricular rhythm disorder (47.62%) including 33.33% of atrial fibrillation; and 11 cases of

ventricular rhythm disorder (52.38%) were found including only one case of ventricular tachycardia (4.76%). Ventricular extrasystole was the most common ventricular rhythm disorder observed on standard ECG (47.62%) (Table I).

On Holter ECG (Table II), 66 patients (81.48%) had at least one supraventricular rhythm disorder, including 3.61% atrial fibrillation and 9.64% atrial tachycardia. 73 patients (90.12%) had presented at least one ventricular rhythm disorder and 59 patients (72.84%) had presented both supraventricular and ventricular rhythm disorders. The distribution of VSEs according to Lown's classification revealed 27.4% class IV A VSEs and 20.55% class IV B VSEs.

Systolic dysfunction (LVEF<50%) was significantly associated with the occurrence of ventricular arrhythmia (p=0.0378).

Discussion

The objective of our work was to study the rhythm disorders presented by patients treated for heart failure in Parakou in 2017. To do so, we conducted a cross-sectional, descriptive, and analytical study with prospective data collection. This study is adapted to this type of question. The two selected centers represented the referral centers for cardiology in Parakou and almost all cardiovascular admissions took place there. The systematic recruitment of HF cases over a period of 6 months allowed us to meet with all patients with heart failure seen during the period. We can therefore affirm the representative character of the sample and generalize the results obtained to the city of Parakou. The data obtained are reliable because the 24-hour Holter ECG is a reference test for the detection of arrhythmias over 24 hours. It provides more information on the electrical activity of the heart than the standard ECG (recording of a few minutes). The SCHILLER Holter ECG is one of the best in terms of its sensitivity and the quality of the tracing obtained. The obtained results were interpreted by two cardiologists.

Sociodemographic characteristics

Age

The average age of our study was 61.47 ± 15.97 years. This average is different from that found by Thiam et al [14] in Dakar, Senegal (50 years). It is close to that of Diallo et al in Mali [15] and Kingue et al in Cameroon [16] who found averages of 59 years and 57.26 ± 16.04 years, respectively.

On the other hand, studies carried out in developed countries showed that the average age of heart failure patients was much higher than ours, ranging from 65.90 ± 11.2 years to 77 ± 8.6 years [17-20].

Thus, heart failure is a disease of the relatively young in developing countries, whereas it is more common in the elderly in industrialized countries. This state of affairs can be explained by the fact that not only is life expectancy higher in the countries of the North, but also by their social security health policy, which allows better treatment of heart failure patients. Indeed, life expectancy is on average 60 years in Africa, whereas in developed countries it is 82 years [21].

Gender

In our study population, there was a predominance of males with a sex ratio of 1.08. This result is similar to that of Travers et al. ~~This result is similar to~~ and ~~that~~ of Traoré [22] in Bamako, Mali, who observed a male predominance with a sex ratio of 1.18. It is also similar to the result found by Idbenyahia and Khatouri [23] in Marrakech, Morocco, who also found a clear male predominance (68.3%). But it differs from that found by Ikama et al [24] in Congo, who observed a female predominance of 56%. Sossou et al [4] in Parakou also found a female predominance with a sex ratio of 0.98. ? We deduce that HF affects both men and women.

Cardiovascular Risk Factors

In our population, the most common cardiovascular risk factors were hypertension (68.67%) followed by obesity (21.69%). These results are similar to those of Hamadou B. et al [25] in Douala, Cameroon, who found that the main cardiovascular risk factors were hypertension and obesity. Our results are also similar to those of Ikama [24] who found a clear predominance of hypertension. Sossou [4] also found that hypertension was the most common cardiovascular risk factor. This result confirms that hypertension is the major cardiovascular risk factor in Africa and therefore the first cause of heart failure in our countries [26,27].

Characteristics of heart failure

In our population, almost half (48.19%) were in NYHA stages III and IV. Ellenga et al [28] in Congo Brazzaville found 68.6% of patients in NYHA stage IV. Kheyi et al [29] in Morocco found that 54% of patients were in NYHA stages III and IV heart failure. These results corroborate those found by Codjo et al in 2020 [5].

We can deduce from these different results that heart failure remains a disabling disease.

The most frequent symptom in our population was dyspnea in a proportion of 98.80%. This result is similar to that of Idbenyahia and Khatouri [23] who found exertional dyspnea in all their patients. It is also similar to that of Pio et al [30] in Lomé who found that dyspnea was the main functional sign (75.1%). These similarities can be explained by the fact that exertional dyspnea is the main symptom of heart failure.

Etiologies of heart failure

The main underlying heart disease was dilated cardiomyopathy (40.96%), followed by ischemic cardiomyopathy (37.35%). These results are similar to those of Codjo et al [5] and Sossou [4] who also found a predominance of dilated then ischemic cardiomyopathy.

Kheyi et al in Morocco [29] found ischemic cardiomyopathy as the main etiology (59.91%). This rate is significantly higher than ours. This could be explained by the absence of coronary angiography in our country, which is a more efficient diagnostic tool, thus underestimating the rate of ischemic cardiomyopathy in our series.

Our results differ from those of Thiam [14] who found valvular disease (44.7%) as the main etiology. This difference could be related to the abusive use of broad-spectrum antibiotics in front of any symptom in our countries. Indeed, according to Hounsa et al. 59.7% of drugs consumed by self-medication in Benin are antibiotics [31]. In addition, the illicit sale of drugs has made access to antibiotics easy [31,32]. This situation, although deplorable, could probably have contributed indirectly to the primary antibiotic prophylaxis responsible for the eradication of rheumatic carditis.

Left ventricular systolic ejection fraction (LVEF)

In our population, the cardiac echodoppler had noted a systolic dysfunction of the left ventricle (LVEF<50%) in 75% of cases. Codjo et al in 2020 [5] found a similar proportion of 69.46%. This result is also similar to that of Pio et al [30] who found a decreased LVEF in 79.1% of cases. N'guissan [6] in Mali also found a reduction in left ventricular systolic function in 72.9% of cases. In Morocco, Kheyi [29] found 80% impaired left ventricular systolic function. Mupinsie [33] reported systolic dysfunction in 73% of heart failure patients in Lomo, Congo. Ikama et al [24] noted systolic dysfunction in 47.2% of cases. Parada, in Spain,

reported 26.50% systolic dysfunction [34]. A study on the epidemiology of heart failure in Europe reported that left ventricular systolic dysfunction was present in 2.9% of patients in Glasgow; 7.7% in Rotterdam; 9% in Helsinki and 7.5% in Southampton [35].

These results demonstrate the advanced and severe nature of cardiac damage in low-income countries.

Treatment

In our population, 92.77% of patients were on diuretic therapy and 78.32% on ACEI/ARB II. Our results are similar to those of Traoré [22] in whom 96.34% and 89.02% of the patients were respectively on diuretic and ACE inhibitor. Abderrhamane [36] in Bamako, found 90% ~~for~~ diuretic-therapy. These results could be explained by the fact that these two therapeutic classes are the ones most used in the treatment of chronic congestive heart failure.

These results are consistent with the recommendations of the European Society of Cardiology (ESC) on the diagnosis and treatment of acute and chronic heart failure. In fact, converting enzyme inhibitors and angiotensin II receptor antagonists have proven to be effective in reducing mortality and morbidity in patients with heart failure. Diuretics are recommended for the reduction of congestive signs and symptoms [37].

Global arrhythmia

In our study population, 97.59% had an arrhythmia diagnosed on auscultation, standard ECG and/or Holter ECG. This result is significantly higher than those found by Ikama [24] and Ellenga [28]. They found 36.3% and 29%, respectively. This large difference could be explained by the fact that Ikama and Ellenga screened their population for rhythm disturbances using only the standard ECG. Indeed, because the standard ECG allows only instantaneous recording, some arrhythmias may be missed because of their absence at the time of recording.

Arrhythmia on standard ECG

On standard ECG, 21 (25.83%) patients had a rhythm disorder. These results are similar to those found by Ellenga [28] and Pio [30]. They found a frequency of 29% and 27.57%, respectively. However, our result is lower than ~~that of~~ Ikamas [24] who found that 36.3% of the patients ~~in his study~~ had cardiac

rhythm disorders. It is also different from that of Idbenyahia and Khatouri [23] who reported 48.3% of rhythm disorders.

In our study, 47.62% had supraventricular rhythm disturbances. This result is similar to that of Pio [30] who found in his study population a frequency of 40%. Ikama [24] found that 45.68% of heart failure patients had a supraventricular rhythm disorder. N'guissan [6] found 22.3% of supraventricular rhythm disorders.

33.33% of our patients with supraventricular rhythm disorders were in atrial fibrillation. This result is similar to that of Ikama [24] who found 39.51% atrial fibrillation. Our result is also comparable to Idbenyahia and Khatouri [23] who observed 35% atrial fibrillation in their population.

14.29% had atrial extrasystoles in our study population. This result is comparable to that of Traoré [22] who found a proportion of 15.85%. Pio et al [30] noted that in their sample, 20.3% had atrial extrasystoles. Our result is different from that of N'guissan [6] who found atrial extrasystoles in 5.4% of patients. This difference could be explained by the fact that the standard electrocardiogram is not a specific test for the detection of atrial extrasystoles nor for the detection of paroxysmal arrhythmias.

In our heart failure population, the most common rhythm disorder was ventricular rhythm disorder (52.38% of cases) with 47.62% ventricular extrasystole and 4.76% ventricular tachycardia. These results are similar to those of Bah [38] and Ikama [24] who found 41% VSE and 4.48% VT, respectively. Pio et al [30] noted 42.7% ventricular extrasystole. In these ~~different~~ studies ventricular rhythm disorder was also the most frequent rhythm disorder.

We can deduce that cardiac rhythm disorders are frequent in subjects with heart failure and that they most often present as ventricular rhythm disorders.

Arrhythmia on ECG holter

The 24-hour electrocardiographic recording showed abnormalities of the heart rhythm in 97.59% of the patients. This result is comparable to that of Hamadou et al [25] who noted abnormalities in all patients ~~(100%)~~ in their series.

Ventricular extrasystoles were the most common (90.12%). This result is comparable to that of Hamadou [25] who also found that ventricular

extrasystole was the most frequent cardiac rhythm disorder and in a proportion of 82.5%.

The classification of ventricular extrasystoles according to Lown allowed us to note class I extrasystoles in 39.75% of patients. This result is similar to that of Haissaguerre et al [39] who found 33% of class I VSE. Class II ventricular extrasystoles were found in 12.33% of our population. This result is comparable to that of Camara [40] who found a proportion of 15.79%. We found a proportion of 27.40% of class IV A ventricular extrasystoles. Our result is similar to that of Fauchier [41] who had 20.2% of class IV A VSE. In our study, 20.55% had class IV B ventricular extrasystoles. Kron [42] found a proportion of 24% of class IV VSE. Grimm [43] in Germany had 35% class IV B VSE. In our population, 47.97% had sustained ventricular extrasystole (class IV A + IV B). This result is similar to that of Meinertz [44] who found 49% of VSE bursts. Haissaguerre et al [39] had 55% sustained ventricular extrasystoles. Huang [45] found 74% doublet VSE (class IV A) and 60% class IV B in the United States.

The distribution of ventricular arrhythmias according to the LOWN classification shows the predominance of class IV in the different series.

Supraventricular extrasystoles were found in 81.48% of cases in our population. Other supraventricular rhythm disorders detected were atrial tachycardias (9.64%) and atrial fibrillations (3.61%). Hamadou et al [25] found 52.5% SSEV; 17.5% atrial tachycardia and 10% atrial fibrillation.

Arrhythmia and ventricular systolic dysfunction

At the end of our study, we noted that systolic dysfunction was associated with ventricular arrhythmias. This association was statistically significant (p=0.0378). In the literature, a correlation between low ejection fraction and the occurrence of ventricular rhythm disorders is frequently found [46,47].

Grimm et al [43] concluded in their study that the alteration of the ejection fraction was predictive for the arrhythmic risk.

Conclusion

The overall prevalence of rhythm disorders was prevalent among heart failure patients in Parakou in 2017. ??? Ventricular rhythm disorder was the most common abnormality found. Severe impairment of systolic function is associated with the occurrence of arrhythmias and makes the prognosis of heart failure pejorative. More conclusions could be added…

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Table I: Distribution of patients according to rhythm disorders on standard ECG, Parakou 2017 (N= 21)

	Number	Percentage
Supraventricular		
Atrial extrasystole	3	14.29
Atrial fibrillation	7	33.33
Ventricular		
Ventricular tachycardia	1	4.76
Ventricular extrasystole	10	**47.62**
Total	21	**100.00**

Table II: Distribution of patients according to rhythm disorders on **Holter,** Parakou 2017 (N= 81).

	Number	Percentage
Supra ventricular		
Atrial extrasystole	66	81.48
Atrial fibrillation	3	3.61
Atrial tachycardia	8	9.64
Ventricular		
Ventricular extrasystole	73	**90.12**

Ventricular Tachycardia	15	18.07