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Research Article

Assessment of the Severity of Refractory Heart Failure at Loandjili General Hospital

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Abstract

Objective: To assess the severity of refractory heart failure (RCI). Patients and method: This is a retrospective and cross-sectional study carried out in the cardiology department of Loandjili General Hospital in Pointe-Noire, Congo-Brazzaville between February 2022 and July 2022. We included records of patients in chronic heart failure (CHF) and RCI whose age ≥ 18 years who received optimized drug therapy. Study variables are biological, therapeutic, echocardiographic, prognosis, demographic, and clinical. P< 5% and the relative risk between 0-1 were significant.

Results: 67 inpatient files were identified. 31 CCI files of which 20 RCMs were included. The prevalence of ICR was 29.8%. There were 18 men (58%) and 13 women (42%); sex ratio of 1.3. The mean age was 58.3± 15.3 years (range: 28-85) and correlated with sex (p<5%). All patients (100%) had NYHA III/IV exertional dyspnea, and intense physical asthenia. Mean systolic blood pressure was 121.58±35.47 mm Hg (range: 60-250), correlated with exertional dyspnoea (P<5%). There were comorbidities, a mean natremia of 138.94±11.62 mEq/l (range: 121-133), a mean serum creatinine of 14.08±5.63 mg/l (range: 6.65-34.8), a mean s BNP of 4040.9 ± 2957.2 pg/ml (ranges: 72.5-10423), a mean left ventricle ejection fraction of 30.95±11.65% (range: 9.63-55.9). The mean left ventricle telediastolic diameter was 63.7±7.8 mm (range: 40.7-75) correlated with exertional dyspnoea (p<5%). Non-drug treatment was not protective against lethality (RR:1,1). The average hospital readmissions was 2.16±1 (range: 1-4) and the average length of hospital stay was 9±3.7 days (range: 4-20). Six patients (19.3%) with ICR had died. Mortality was correlated with certain clinical, biological and echocardiographic aspects (P<5%). The mean peak of VO 2 was 22.41±5.2 ml/min/kg (range: 12-33.85), and that of the ELAN HF score was 4.51±1.48 (range: 2-8).

Conclusion: The occurrence of RCM is a major eventin the evolution of CCI. Clinical, haemodic, biological, hospital readmission and different scoresare essential markers of prognostic evaluation. The deficit of the technical platform is amajor han dicap.

Keywords: chronic refractory heart failure; severity; assessment; prognosis

Introduction

Heart failure (HF) is a pathophysiological condition characterized by the inability of the heart to provide cardiac output that meets the metabolic demands of the body. This failure is considered chronic (CCI) when it is accompanied by intense asthenia, dyspnea of effort or rest, cough or edema of the lower limbs (OMI). Refractory heart failure (RCM) is CHF that no longer responds to maximized conventional drug therapies. In other words, an ICR patient is one who requires resuscitation with oxygen therapy and dobutaminotherapy, palliative care, heart transplant eligibility, hospital readmissions within the previous six months, circulatory support, activation by implantable cardioverter defibrillator (ICD), and physical training.

According to Cowie MR et al., HF remains a major public health problem. Its increasing incidence is dependent on the aging of the population and the optimal therapies prescribed in the context of many heart diseases such as myocardial infarction and high blood pressure (hypertension). His prognosis remains poor with considerable mortality. We do not know exactly the incidence of ICR, but the incidence of CHF in France is in the order of 1.3 cases per 1000 population observed particularly in the elderly [1]. The management of CCI in the West is multidisciplinary. It benefits from well-codified programs intended exclusively for patient follow-up [2]. In sub-Saharan Africa, this care is sometimes hampered by non-enforceability, lack of multidisciplinary meetings, and incongruity of some actors involved. Recurrent congestive cardiac decompensations under maximum conventional medical treatment are essential indications for hospitalization and heart transplantation [3]. In our context, these indications pose real problems for the patient and his family circle, as well as for medical ethics. They make it possible to highlight that our therapeutic proposals of heart transplantation, circulatory support, cardiac stimulation or placement of a DAI paraissent delicate, even illusory for reasons of inadequate technical platform and harmful social beliefs. However, we question the acceptability of taking charge of the RCM in our context. In addition, what is the impact of the scores, in particular that of ELAN-HF (European coLlaboration on Acute decompeNsated Heart Failure) [4], and the measurement of the maximum peak of VO_2 in the evaluation of hospital readmissions, in mortality, as well as in the indication of heart transplantation? In this regard, we undertake this work with a view to assessing the severity of ICR in a Congolese hospital setting.

Ipatients and method:

This is a retrospective and cross-sectional study, carried out in the cardiology department at the Loandjili General Hospital in Pointe Noire in Congo-Brazzaville between February 2022 and July 2022, i.e. 6 months.

Our study focuses on the records of patients hospitalized for ICD. Each record includes a medical observation, a front chest x-ray, an electrocardiogram, a Doppler echocardiogram and a biological assessment. We retained records of CHF and ICR patients ≥ 18 years of age who received optimized medical therapy including a renin-angiotensin system inhibitor, beta blocker, nitrates, and diuretics. The diuretic treatment based on furosemide consists of reinforcement by injections at a dose of 500 mg to 1g per dayor continuous infusion. In the absence of significant improvement, we used dobutamine with the electric syringe at a dose of 20-30 mg/kg/min sometimes combined with dopamine due to 5-10 mg/kg/min to maintain good diuresis. We excluded the records of patients with haemoglobinopathies, neoplasia, primary pulmonary arterial hypertension, pericardial involvement and x betaintolerant blockers. A team of dieticians, psychologists and nurses provided psychological support (SP), personal motivation for care (MPPC), as well as the provision of personalized nutritional information (INP). Follow-up of patients was monthly. The diagnosis and etiologies of HF were retained on clinical and paraclinical arguments. We had not been able to perform ventricular resynchronization, pacemaker implantation, circulatory support, coronary angiography or cardiac scintigraphy for reasons of technical platform. ICR was clinically defined as class III-IV stress dyspnoea (NYHA classification) accompanied by either intense physical asthenia or collapse of the VO_2 peak and recurrence of hospitalization for HF flare-ups in the previous 6 months despite therapeutic optimization trials. The maximum peak of VO 2 was obtained by Cahalin's formula (peak of VO_2 = 0.03 x estimated distance traveled + 3.98). The estimate of distance travelled (EDP) was obtained by the Troosters formula: 218 + (5.14 x Height in cm) – [(5.32 x age in year) – (1.8 x weight in kg)] – [51.31 x sex]. A value of 1 was assigned for males, and zero for females. The normal value of the VO_2 peak used was > 20 ml/min/kg. A peak VO_2 between 12-14 ml/min/kg was considered to have a poor prognosis, as well as a PDE < 300 m. Patients were allocated according to the peak of VO_2 according to the Weber classification. Biologically, the ICR was retained either by hyponatremia ≤ 130 mmol / l, or by renal or hepatic impairment, or by a positivity of natriuretic peptides type B (BNP) > 107.5 pg / ml at discharge. HF was rated as unlikely when BNP< 400 pg/ml. It was uncertain when this rate is between 400-2000 pg/ml and probable when it is > 2000 pg/ml. Echocardiographically the RCI was defined by an ejectional fraction of the left ventricle (LVEF) < 35% (according to the Simpson biplane method), by pseudonormal or restrictive mitral flow and by pressure in the right atrium > 12 mm Hg. LVEF has been classified as severe when it is < 35%, medium when it is between 35-45%, and moderate when it is between 45-55%. Patient prognosis was assessed by clinical course, LVEF class, left ventricle telediastolic diameter (DTDVG), patient survival (hospital readmissions, length of hospital stay, observed deaths), VO_2 peak, NPN level, natremia, serum creatinine, systolic blood pressure (SBP), and ELAN-HF score. The components of the score were age > 75 years, existence of dyspnoea of effort NYHA III/IV, IMO, systolic blood pressure < 115 mm Hg, natremia < 135 mmoles/l, elevated serum creatinine and BNP. A value of 1 was assigned to each variable in this score except NPP. Thus, a BNP rate between 1500-5000 corresponds to 1. A rate between 5001-15000 corresponds to 3, and a rate > 15000 corresponds to 4. This score has been ranked low when it is ≤ 2, intermediate when it is between 3-4, high when it is between 5-7, and very high when it is ≥ 8. Study variables were biological, echocardiographic, therapeutic, prognosis, demographic, and clinical.

Data were analysed using epi info 7 and SPSS 25. Quantitative variables are expressed as a mean ± standard deviation, and qualitative variables as percentages. The chi- deux test was carried out to check for possible links between qualitative variables, that of linear correlation for possible links between quantitative variables, and the *odds ratio (OR)* to assess the relative risk (*RR*). non-drug treatment on mortality. Through a univariate analysis, we first selected prognosis-related covariates that have a degree of significance between 0.20-0.25. We then performed a multivariate analysis using the previously selected univariate covariates and selected those that are independently related to prognosis. The significance *p* required for this purpose should be < 5%, and the relative risk *(RR)* between 0-1.

Iiresultats :

II A)- Demographic and Clinical Aspects.

A1)- Distribution of patients according to demographics.

During the study period, 67 inpatient records were identified. 31 records were labelled ICC, including 20 RCI patient records. The prevalence of RCI was 29.8%. There were 18 male (58%) and 13 female (42%) cases, for a sex ratio of 1.3. The mean age was 58.3±15.3 years with extremes ranging from 28-85 years. Two patients (6.4%) were in the 20-30 age range, Three patients (9.6%) were in the 31-41 age group. This bracket included two women and one man. Six patients (19.3%) were in the 42-52 age range. It consisted of three men and three women. Eight patients (25.8%) were in the 53-63 age range, and there were seven men and one woman. Eight other patients (25.8%) were in the 64-74 age group. It was represented by six men and two women. Finally, four patients (12.9%) were in the 75-85 age group. There were three women and one man. There was a significant difference between age and sex (χ^2: 5.07; *p*: 0.02). Figure 1 shows the distribution of patients by age and sex.

A2)- Distribution of patients according to clinical aspects and the existence of comorbidities.

A21)- Distribution of patients according to clinical symptomatology.

All patients (100%) had severe physical asthenia and exertional dyspnoea (24 patients (77.4%) were on NYHA III and seven patients (2 2.6%) on NYHA IV). Stress dyspnoea was related to hypokinetic dilated cardiomyopathy (CMD) in 16 patients (51.6%), myopericarditis in four patients (12.9%), valvular heart disease in three patients (9.6%), and ischemic heart disease in two patients (6.4%). 25 patients (80.6%) had regular tachycardia. There were six patients (19.3%) with atrial fibrillation. 27 patients (87%) had lower limb oedema, jugular vein turgor and pulmonary

congestion. One patient (3.2%) had cold sweat, skin pallor, chest pain, and pulmonary condensation syndrome. There was no significant association between age and exertional dyspnoea. (χ^2:0.20; *p*:0.65).

A22)- Distribution of patients according to body weight.

The average weight of patients was 62.63±16.4 kg with extremes of 38-99 kg. Thus, six patients (19.3%) had a weight between 39-47 kg. The weight of six other patients (19.3%) was between 57-65 kg. Five patients (16.1%) weighed between 48-56kg, 66-74kg and 75-83kg, respectively. Three patients (9.6%) weighed more than 84 kg. Finally, a weight between 30-38kg was noted in one patient (3.2%). Body weight was not statistically related to exertional dyspnoea (χ^2:0.20; *p*:0.65) or CCI/RCI (χ^2:1.58; *p*:0.20).

A23)- Distribution of patients by size.

The average height was 165.6±9.4 cm with extremes between 148-185 cm. 13 patients (41.9%) were between 158-166 cm tall. Six patients (19.3%) had a height between 149-157 cm. Five patients (16.1%) respectively had a height between 167-175 cm and 176-182 cm. The height of a patient (3.2%) was between 140-148 cm. Finally, a height above 183 cm was noted in one patient (3.2%).

A24)- Distribution of patients according to systolic blood pressure.

The mean systolic blood pressure was 121.58±35.47 mm Hg with extremes between 60-250 mm Hg. 12 patients (38.7%) had systolic blood pressure between 91-121 mm Hg. Nine patients (29%) had systolic blood pressure between 122-152 mm Hg. It was between 60-90 mm Hg in six patients (19.3%). Three patients (9.6%) had systolic blood pressure between 153-182 mm Hg. Finally, systolic blood pressure was found above 183 mm Hg in one patient (3.2%). Systolic blood pressure was statistically related to exertional dyspnoea (χ^2: 8.7; *p*: 0.003).

A25)- Distribution of patients according to the estimated distance traveled (EDP).

The average PDE was 619.94±167.77 m with extremes ranging from 310-995.61 m. Respectively eight patients (25.8%) had a PDE between 500-600m and between 600-700m. Respectively, three patients (9.6%) had a PDE between 300-400 m, 400-500 m and 800-900 m. Finally, two patients (6.4%) wereabove 900 m. there was no statistical link between PDE and SBP (χ^2: 15.8; *p*:0.46).

A26)- Distribution of patients according to comorbidities.

18 patients (58%) had hypertension, four patients (12.9%) had bacillosis, three patients (9.6%) were ethyl. Respectively, two patients (6.4%) had chronic renal failure and diabetes mellitus. Two patients (6.4%) had HIV-positive serology. Finally, one patient (3.2%) suffered from metabolic gout. The absence of comorbidities was observed in three patients (9.6%).

IIB)- Biological Aspects.

Our patients did not have iron deficiency anaemia, but there were sometimes disturbances in therenal, ionic and BNP profiles.

B1)- Distribution of patients according to natremia

The mean natremia was 138.94±11.62 mEq/l with extremes between 121-165 mEq/l. Nine patients (29%) had natremia between 134-140 mEq/l. There were seven patients (22.5%) with natremia between 127-133 mEq/l. Six patients (19.3%) had natremia between 141-147 mEq/L. Natraemia ranged from 120-126 mEq/l in four patients (12.9%). Natraemia was found between 155-161 mEq/l in three patients (9.6%). Finally, two patients (6.4%) had natremia between 162-168 mEq/l. Natraemia was not correlated with LVEF (χ 2:1,22:*p*:0.25), nor with exertional dyspnoea (χ 2:0.25; *p*: 0.29).

B2)- Distribution of patients according to serum creatinine.

Mean serum creatinine was 14.08±5.63 mg/l with ranges between 6.65-34.8 mg/l. 14 patients (45.1%) had serum creatinine between 10-13 mg/l. Five patients (16.1%) respectively had serum creatinine between 6-8 mg/l, 14-17 mg/l, and 18-21 mg/l. One patient (3.2%) had serum creatinine between 22-25 mg/l. Finally, another patient (3.2%) had serum creatinine above 30 mg/l. Creatinine was not statistically related to CCI/RCM (χ^2:1,15; *p*:0.2), exertional dyspnoea (χ^2:0.25; *p*:0,29).

B3)- Distribution of patients according to natriuretic factors (BNP).

The mean BNP level was 4040.9±2957.2 pg/ml with extremes between 72.5 -10423 pg/ml. 22 patients (70.9%) had BNP > 2000 pg/ml. Seven patients (22.6%) had BNP levels between 400-2000 pg/ml. Finally, two patients (6.4%) had BNP< 400 pg/ml. Thus, 14 patients (70%) with ICR had a BNP>2000 pg / ml level. Four patients (20%) in ICR had a BNP level between 400-2000 pg/ml and two patients (10%) in ICR had a BNP< 400 pg/ml level. The sensitivity of BNP in ICR patients was 0.77 and specificity was 0.61. The difference was not statistically significant between BNP and CI type (χ^2:0.31; *p*:0.5), nor with exertional dyspnoea (χ 2:2.41; *p*: 0.12). Table I illustrates the distribution of patients in RCM according to the NPN rate.

II C)- Aspects Echocardiographiques.

All patients (100%) had a restrictive mitral profile. 27 patients (87%) had a right intraatrial pressure elevation > 12 mm Hg. The interventricular septum was paradoxical in six patients (19.3%).

C1)- Distribution of patients according to the LVEF.

The average LVEF was 30.95±11.65% with extremes of 9.63 – 55.9%. Respectively 10 patients (32.3%) had LVEF between 20-30% and 30-40%. Five patients (16.1%) had LVEF between 40-50%. Three patients (9.6%) were with LVEF between 10-20%. There was one patient (3.2%) with LVEF between 0-10%. Finally, two patients (6.4%) had LVEF above 50%. Thus, 22 patients (71%) had severe LVEF in which there were 16 patients (51.6%) in ICR and six patients (19.3%) in CHF. Five patients (16.1%) had moderate LVEF, and there were three patients (9.6%) in ICR and two patients (6.4%) in CHF. Finally, there were four patients (12.9%) with mean LVEF and one patient (3.2%) in ICR and three patients (9.6%) in CHF. LVEF was not statistically related to exertional dyspnoea (χ^2: 0.50; *p*: 0.47), and there was no significant difference with CI type (χ^2:3.64; *p*: 0.056). Table II shows the distribution of patients by LVEF classification and HF type. Figure2 shows the distributionof patients according to LVEF.

C2)-Distribution of patients according to the telediastolic diameter of the left ventricle (DTDVG).

The mean left ventricle telediastolic diameter (DTDVG) was 63.7±7.8 mm with extremes of 40.7-75 mm. 13 patients (41.9%) had a left ventricle telediastolic diameter between 60-70 mm. Eight patients (25.8%) respectively had DTDVG between 50-60 mm and 70-80 mm. Two patients (6.4%) had DTDVG between 40-50 mm. The difference was significant between DTDVG and exertional dyspnoea (χ^2:8,4; *p*: 0.003). In contrast, it was not significant between DTDVG and CI type (χ^2: 0.57; *p*: 0.44). Table III shows the distribution of patients by DTDVG.

II (D)- Therapeutic Aspects.

D1)- Distribution of patients according to non-drug therapy (TNM).

21 patients (67.7%) had MPPC.19 patients (61.3%) had MS. 18 patients (58%) had NPI. Finally, eight patients (25.8%) were weaned from harmful substances. Thus, 23 patients (74.2%) had no non-drug treatment. Five patients (16.1%) were receiving non-drug treatment. This non-drug treatment was not protective against lethal outcomes (*OR*: 1.9; *RR*: 1.10).

D2)- Distribution of patients according to drug therapy.

All patients (100%) received a maximum dose of renin-angiotensin system inhibitors [27 patients (87%) were on ACE inhibitors and four patients (12.9%) on ARB2], beta blockers, and diuretics (congestive furosemide,

spironolactone and a thiazide diuretic). Six patients (19.3%) were on oxygen therapy and dobutaminotherapy. Nitrates were prescribed in two patients (6.4%). Therapeutic withdrawal from inotropic drugs was impossible in three patients (9.6%). No patients had received sacubitril/valsartan therapy.

II e)- Prognostic Aspects.

E1)- Distribution of patients according to survival.

E11)- Distributionof patients according tohospital readmissions.

The average hospital readmissions was 2.16± 1 with extremes between 1-4. Thus, 12 patients (38.7%) had two hospital readmissions. Six patients (19.3%) had three hospital readmissions. There were four readmissions in four patients (12.9%). Finally, nine patients (29%) had hospital readmission. There were no statistical associations between hospital readmissions and HF type (χ^2:0.0011; *p*: 0.97), nor with exertional dyspnoea (χ^2: 0.25; *p*: 0.61). Table IV shows the distribution of patients according toho spital readmissions.

E12)- Distribution of patients according to length of hospitalization.

The average length of hospital stay was 9±3.7 days with extremes between 4-20 days. 14 patients (45.1%) had a length of hospital stay between 5-9 days. 12 patients (38.7%) were hospitalized between 10-14 days. There were three patients (9.6%) hospitalized between 0-4 days. Finally, respectively one patient (3.2%) had days of hospitalization between 15-19 days and beyond 20 days. Length of hospital stay was not correlated with exertional dyspnoea (χ^2:1.36; *p*: 0.24).

E13)- Distribution of patients by mortality.

Six patients (19.3%) in ICR had died, five men and one woman. Three patients (9.6%) died from sudden death. Respectively, one patient (3.2%) died of chronic renal failure, cardiogenic shock and cardiorespiratory arrest. The occurrence of death wasstatistically significant with systolic blood pressure (χ^2:5.59; *p*: 0.0018), with DTDVG (χ^2: 4.52; *p*: 0.03), natremia (χ^2: 4.5; *p*: 0.03), and with serum creatinine (χ^2: 5.93; *p*: 0.014). Table V shows the distribution of patients by HF type and mortality.

E2)- Distribution of patients according to the peak of VO 2 (PVO_2).

The mean PVO 2 was $22.41\pm_{5.2}$- ml/mn/kg with extremes between 12-33.85 ml/min/kg. 22 patients (71%) were in Weber class A, corresponding to 15 patients (48.3%) in ICR and seven patients (22.6%) in CHF. Five patients (25.6%) represented Weber's Class B. In this class, two patients (6.4%) were on ICR and three patients (9.6%) were on CHF and three patients (9.6%) on CHF. Finally, four patients (13%) were in Weber class C. There were three patients (9.6%) in ICR and one patient (3.2%) in CHF. Statistically, the VO 2 peak was correlated with the PDE (χ^2: 0.99; *p*: 0.02). On the other hand, there was no correlation with LVEF (χ^2 : 30; *p*: 0.46), nor with the ELAN HF score (χ^2:4.23; *p*:0.23), nor with the occurrence of deaths (χ^2:0.47; *p*: 0.49). Table VI shows the distribution of patients by HF type and Weber classification.

E3)- Distribution of patients according to ELAN HF score.

The average ELAN HF score was 4.51± 1.48 with extremes between 2-8. 12 patients (38.7%) had an ELAN HF score of four. Five patients (16.1%) had an ELAN HF score of five. An ELAN HF score of six was found in five patients (16.1%). Three patients (9.6%) had an ELAN HF score of three. Three other patients (9.6%) had an ELAN HF score of two. The ELAN HF score was seven in two patients (6.4%). Finally, one patient (3.2%) had an ELAN HF score of eight.

Three patients (9.6%) had a low ELAN HF score. Among them, there were two patients (6.4%) in ICR and one patient (3.2%) in CHF. The ELAN HF score was intermediate in 15 patients (48.3%). In this range, eight patients (25.8%) were on ICR and seven patients (22.5%) were on CHF and seven patients (22.5%) on CHF 11 patients (35.4%) had a high ELAN HF score. This group included eight patients (25.8%) in ICR and three patients (9.6%) in CHF. Finally, two patients (6.4%) in ICR had a very high ELAN HF score. Statistically, the difference was significant between ELAN HF score and exertional dyspnoea (χ^2:4.21; *p*: 0.04). ELAN HF score was not correlated with the occurrence of deaths (χ^2:0.52; *p*: 0.46), nor hospital readmissions (χ^2: 3.34; *p*: 0.76). Table VII represents the distribution of patients by HF type and classification of the ELAN HF score.

Iiidiscussion

The disproportionate response to heart failure is an effective but deleterious adaptation in the short or long term. It aggravates the initial myocardial involvement, and that of other organs [5]. The hypo perfusion of organs caused by these adaptive mechanisms will gradually cause myopathy, muscle wasting due to lack of physical activity, dyspnea of effort and intense muscle asthenia. These last two signs are major during the BRI as we had seen. Patients with ICR are a non-homogeneous group according to their age and the degree of myocardial or visceral lesions observed. These are patients previously in NYHA class II-III previously balanced by conventional treatment who become unexpectedly symptomatic at rest, and who respond poorly to the various medical therapies proposed. Considering that the estimation of the prognostic value in heart failure passes through the practice of the stress test with analysis of gas exchange, we can say that our study suffers from a bias because the measurement of the peak of VO_2 and the six-minute walk test, which is an instrument for predicting maximum capacity, were obtained by the formulas of Cahalin and Troosters. Very seriously, we have reappropriated these formulas for two essential reasons: The existence of a linear relationship between the peak of VO 2 and the PDE in severe heart failure, and there luctance of some cardiologists to practice physical activity in patients with CHF for their vulnerability and instability [6].

RCI occurs in juvenile settings with a male predominance. This epidemiological difference with developed countries is probably related to a better life expectancy of Westerners [7,8]. In addition, our prevalence is similar to that of Pio et *al* in Togo [9]. The vast majority of patients present during episodes of decompensation with congestive signs of right heart failure. These heart failures labeled severe are regularly accompanied by muscle wasting, alteration of the body mass index, thus constituting real cachexia. The lack of physical activity related to exertional dyspnea, as well as digestive disorders caused by liver and intestinal congestion can explain this state of extreme weight loss [10]. Blood pressure, strongly correlated with stress dyspnea, is long maintained at normal, but the drop in cardiac output and the iatrogenic effect of some drugs especially vasodilators, cause a barometric decrease in severe myocardial failure. In our series, this barometric decrease estimated at 19.3% was linked to hypokinetic DCM and cardiogenic shock. The observed comorbidities may alter the syndromic treatment of HF on the one hand, and medications for these comorbidities may worsen HF on the other hand. Thus, the majority of comorbidities are accompanied by an alteration of the overall clinical status and are the factors of poor prognosis. Under these conditions, they must be considered as therapeutic targets. We had not found iron deficiency anemias, but 61.3% of our patients had major depression that required psychological care. Concretely, ICR patients are vulnerable and face a poor prognosis, dominated by the fear of sudden death or heart transplantation [11]. The multidisciplinary approach is highly recommended, and it relies on a medical team consisting of cardiologists, attending physicians, dieticians, social workers and psychologists, coordinated by a nurse who provides therapeutic education. This approach is not protective against lethality (*OR*: 1.9; *RR*: 1.10), but it nevertheless allows psychological support through authorized prayer sessions, family assistance in a hospital setting, withdrawal from harmfulness, personalized nutritional information, as well as motivation for personalized care, while explaining to the patient that it is a chronic disease, and adherence to treatment is essential for survival. The objective of this multidisciplinary approach is to reduce mortality and rehospitalization for episodes of cardiac decompensation. These rehospitalizations are serious, financially costly [12], not correlated with HF as we have pointed out and illustrate the refractory nature of CHF. Our length of stay is similar to that of

other authors [12]. The renal changes observed during HF are particularly dependent on the renin angiotensin system and are characterized by the production of angiotensin II. This produces vasoconstriction that increases serum creatinine and lowers natremia. Therefore, these changes are closely correlated with the mortality we observed. The stimulus of synthesis of BNP is related to the increase in volumetric and barometric constraints. They can therefore serve as adiagnostic marker in HF, and can be used to judge the improvement or not of the patient under treatment, but their sensitivity, as well as their specificity in the ICR is poor as we note. The high rate of BPN at discharge from hospital is an index of severity, hospital readmission within 6 months or recurrence of HF as mentioned in the literature [13]. Despite considerable therapeutic advances, RCM remains a serious condition characterized by high mortality. Patients die in a table of progressive and terminal HF, refractory to optimized medical treatment or sudden death. In such circumstances, the evaluation of pronostic becomes a fundamental moment based on the search for markers considered independent of severity. In our series, the impossibility of weaning certain essential drugs, in particular vasodilators and diuretics, has also been considered in the clinical course as a marker of poor prognosis [14]. DTDVG ectasia on echocardiography and Doppler, low systolic blood pressure, NYHA class III and IV, ELAN HF score (high or very high), impaired left ventricular diastolic function, hyponatremia, as well as renal profile disruption are all pejorative markers that we have also recorded [4, 15, 16]. On the other hand, the pejorative prognostic value of the measurement of the peak of VO_2 is recognized only at the end of the institution of optimized medical treatment. Indeed, it is conventional to see that a poor result of a VO_2 test performed during an initial hospitalization for CHF improves at the patient's discharge from the hospital [17]. In addition, the peak of VO_2 proposed as a prognostic parameter is applicable only in the patient in IC without beta blocking as Corra U et *al.* [18], which may justify our 71% of patients in Weber's class A, and the lack of interest we have given to this parameter in the occurrence of deaths, but it remains the main prognostic marker in the prescription of physical activity in CCI, as well as an indispensable part of the therapeutic arsenal [19,20]. Risk scores such as ELAN HF make it possible to confidently identify patients at higher risk. In this respect, a patient with a lower risk HF is a patient without comorbidities, without smoking who receives conventional treatment with a renin inhibitor angiotensin II and beta blockers, his blood pressure is elevated and his ejection fraction from the left ventricle is impaired [21]. In reality, the least risk exists only temporarily. Depending on the patient's progressive age, this low risk can reach higher levels x and subsequently constitute a severity. In general, clinical criteria such as advanced age, low weight or cachexia, age of HF, the notion of cardiogenic shock, persistence of congestive signs of HF or low blood pressure are poor prognostics as illustrated by some authors [22]. Medical problems are associated with those of medical ethics, characterized by a particular dependence of patients on health structures capable of relieving them as much as possible. In addition, the use of new drugs or innovative techniques requires the agreement of the patient or his family circle in order for a decision to be taken in its entirety.

Conclusion

The progression of CCI to the ICR stage is serious overall. Flare-ups are less and less sensitive to optimized medical therapies. The multidisciplinary approach is essential but not protective of mortality. Clinical, hemodynamic, biological, hospital readmissions, including score disruption, are essential markers of prognostic assessment. The peak of VO_2 is an unreliable parameter in the assessment of the severity of ICR. The deficit of the technical platform is a major handicap in our context.

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