BRIEF ARTICLE

Heart Failure Day Hospital as a Comprehensive Approach Strategy in the Heart Failure Unit: Analysis of a Single Center in Latin America

Hospital de día en la unidad de insuficiencia cardíaca como una estrategia de abordaje integral: análisis de un único centro en América Latina

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ABSTRACT

Background: To describe the clinical characteristics, impact on quality of life, functional class (FC), number of hospitalizations, and survival rate of patients with heart failure (HF) enrolled in an heart failure day hospital (DH).
Methods: Patients enrolled in a DH for infusion of iron, furosemide, levosimendan —or the combination of these two drugs— over a 3-year period were retrospectively analyzed. Baseline and 6-month variables were FC (NYHA), 6-minute walk test (6MWT) and quality of life using the Minnesota questionnaire (MLHFQ). The number of HF hospitalizations was compared with that of the year prior to DH enrollment, and survival was assessed at 1-year follow-up.
Results: A significant improvement in FC was observed in all four groups. and a decrease of HF hospitalizations in the first three
Conclusions: DH development can change the present and future of this population.

Key words: Heart failure – Readmissions – Functional class – Quality of life – Mortality

RESUMEN

Objetivos: Describir las características clínicas, el impacto en la calidad de vida, la clase funcional (CF), el número de internaciones y la supervivencia de los pacientes que ingresaron a un hospital de día (HD) de insuficiencia cardíaca (IC).
Materiales y Métodos: Se analizaron en forma retrospectiva aquellos pacientes que ingresaron a un HD para la infusión de hierro, furosemida, levosimendán o la combinación de estos dos últimos fármacos, durante un período de 3 años. Las variables analizadas, al inicio y a los 6 meses, fueron la CF (NYHA), la prueba de marcha de 6 minutos (PM6M) y calidad de vida mediante el cuestionario de Minnesota (MLHFQ). El número de internaciones por IC fue comparado con el del año previo al ingreso al HD y la supervivencia fue evaluada al año de seguimiento.
Resultados: Se observó una mejoría significativa de la CF en los cuatro grupos y del número de internaciones por IC en los primeros 3.
Conclusiones: El desarrollo del HD puede modificar el presente y futuro de esta población.

Palabras clave: Insuficiencia cardíaca – Reinternaciones – Clase funcional - Calidad de vida - Mortalidad

INTRODUCTION

Given the increased life expectancy of the population and the therapeutic advances, heart failure (HF) has become one of the main causes of hospitalization, leading to an increase in healthcare costs. (1, 2)

In recent years, it has been evident that early management of decompensation episodes is a tool that reduces mortality and healthcare costs. (3, 4) The Heart Failure Unit (HFU) and the Heart Failure Day Hospital (DH) are a cornerstone in the comprehensive approach to this condition.

Objectives

- To describe the clinical and demographic characteristics of a population enrolled to a DH for iron, furosemide, levosimendan or furosemide + levosimendan infusion.
- To analyze the impact on quality of life (QoL) and functional class (FC) at baseline and at 6 months in patients enrolled in a DH.
- To evaluate the number of HF hospitalizations one year after enrollment in a DH compared to the previous year, and late follow-up survival.

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METHODS

Patients enrolled in a DH for infusion of iron, furosemide, levosimendan or furosemide + levosimendan in a single center were retrospectively analyzed over a 3-year period.

DH admission criteria for iron infusion (I-DH) were absolute iron deficiency (AID) (ferritin < 100 ng/mL) or relative iron deficiency (RID) (ferritin 100 - 300 ng/mL and transferrin saturation percentage < 20%). The protocol was adapted according to the CONFIRM HF study. (5)

Admission criteria for levosimendan infusion in DH (L-DH) were one or more hospitalizations due to low cardiac output syndrome (LCOS) in the past year, and not being a heart transplant candidate. The protocol was adapted according to the LION HF study. (6)

Admission criteria for furosemide infusion in DH (F-DH) were 2 or more decompensated HF hospitalizations in the past year under treatment with ≥ 200 mg/day of oral furosemide. The following variables in each of the protocols at baseline and at 6 months after enrollment were analyzed: FC (NYHA), 6-minute walk test (6MWT) and quality of life using the Minnesota questionnaire (MLHFQ). The number of HF hospitalizations and survival rate were assessed at 1-year follow-up. Continuous variables were expressed as mean and standard deviation or median and interquartile range, and categorical variables as absolute values and percentages. Paired T test or Wilcoxon test (continuous variables), and Chi square or Fisher test (categorical variables) were used to compare groups. Survival was analyzed with the Kaplan-Meier method, and comparatively with the log-rank test. A p value < 0.05 was considered statistically significant.

RESULTS

A total of 47 patients were enrolled in the DH at our center from May 2017 to May 2020: 31 men (66%), aged 61±14 years. Median follow-up was 17.7 months (range: 2.2 - 35.5 months). Table 1 shows the baseline characteristics of the population, and prevalent etiologies are shown in Figure 1. Only in 47% of the population was it possible to titrate the optimal medical treatment (OMT) for deteriorated left ventricular systolic function according to international guidelines. Seven patients (15%) received levosimendan infusion; 26 (55%) received iron carboxymaltose —16 (61%) with AID and 10 (38%) with RID—, 10 (21%) received furosemide, and 4 (8.5%) furosemide + levosimendan. Adverse effects only included hypotension in 3 patients (6%) from the L-DH group, not requiring cessation of infusion.

Table 2 shows NYHA FC, 6MWT distance walked, and MLHFQ score at enrollment in the DH and at 6-month follow-up for each infusion group.

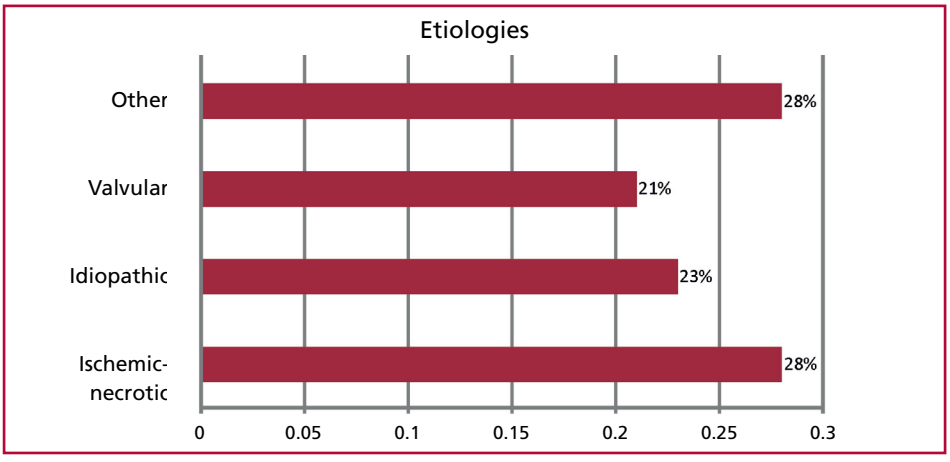
In the L-DH group, a statistically significant improvement in FC (NYHA) was detected (p = 0.02). In the I-DH group, a statistically significant improvement was observed in the FC (NYHA) and 6MWT distance (p = 0.01), but not in the Borg scale. A statistically significant improvement in FC (NYHA) and 6MWT (p = 0.03 and p = 0.01, respectively) was

Table 1. Baseline characteristics of the population and etiologies

	L-DH	F-DH	I-DH	L+ F-DH
Patients (%)	7 (15)	26 (55)	10 (21)	4 (8.5)
Age (years)	67±12	60±13	60±15	64±13
Men (%)	6 (86)	14 (54)	7 (70)	4 (100)
LVEF (%)	23±6	32±11	37±1	33±13
HBP (%)	2 (29)	17 (65)	4 (40)	3 (75)
DM (%)	1 (14)	5 (19)	4 (40)	2 (50)
DLP - %	3 (43)	17 (65)	8 (80)	3 (75)
Overweight (%)	1 (14)	11 (42)	8 (80)	1 (25)
RF (%)	2 (29)	3 (11)	2 (20)	4 (100)
OMT (%)	1 (14)	18 (69)	3 (30)	0 (0)

Ref. LVEF: Left ventricular ejection fraction. HBP: High blood pressure. DM: Diabetes mellitus. DLP: Dyslipidemia. OMT: Optimal medical treatment.

Fig. 1.



observed in the F-DH group, while an improvement only in NYHA FC (p = 0.02) was evidenced in the L + F-DH group.

At 1-year follow-up, a statistically significant reduction in the number of HF admissions was observed in the F-DH, L-DH and I-DH groups compared to the year prior to enrollment in the DH. One-year survival was 85% in L-DH and I-DH patients, 100% in F-DH patients, and 75% in those from the L+F-DH group. No statistically significant difference was observed among the groups (p = 0.9) (Figure 2).

DISCUSSION

Heart failure (HF) is a clinical syndrome characterized by symptoms and signs caused by structural or functional abnormalities of the heart. Advanced HF is influenced by specific conditions such as intermittent need for diuretic treatment, hospitalizations, intermittent inotropic drugs, and recurrent malignant arrhythmias; in this context, the development of Units of Heart Failure is key to reduce the impact of the disease progression.

It is estimated that after hospitalization for HF, 25% of patients will be readmitted within 30 days and 50% within 6 months. In-hospital mortality ranges between 4% and 12% but is > 20% in high-risk patients and reaches 20-30% in a year. (7)

One of the most important interventions to change HF prognosis is OMT, which reduces mortality and number of hospitalizations. (8) In our population, more than 50% of patients only from the I-DH group received OMT, probably because it was the group with the lowest prevalence of chronic renal failure, enabling initiation and titration of renin-angiotensin system inhibitors and antagonists, and antialdosterone drugs. On the other hand, there is strong evidence that beta-blockers can reduce long-term morbidity and mortality in patients with HF. Sometimes, however, its use could worsen symptoms in a population with a more severe clinical profile and a mortality rate that can be > 50% at one year. (9, 10) For this reason, it was not possible to prescribe them in the L-DH and L+ F-DH groups. Regarding the comparison and scientific evidence of the OMT followed in our series, it was consistent with the recommendations in most cases. In certain cases, it was not possible due to comorbidities or problems with the cost of medications.

As for overall assessment, FC was evaluated using the NYHA scale. Its validity is questioned due to its semi-quantitative nature, subjectivity in classification, and influence of comorbidities. Furthermore, 6MWT is an indirect but objective measure of functional capacity. Its validity is independent of the etiology, baseline NYHA FC or left ventricular ejection fraction (LVEF), and presents good prognosis associated with mortality. (11)

In HF, QoL is affected by limited mobility, pain, anxiety and depression, and its measurement becomes an independent predictor of mortality, heart transplant, hospitalizations, or palliative care. Assessing QoL is a key factor in determining the effectiveness of these comprehensive healthcare programs. The *Minnesota Living with Heart Failure Questionnaire* (MLHFQ) scale was used in our population. (12, 13)

Intermittent administration of inotropes may improve HF symptoms and QoL, and reduce the number of hospitalizations. The L-DH group showed FC improvement and a reduction in the number of hospitalizations, with no arrhythmias as adverse event, as evidence shows. (14)

Iron deficiency and anemia are common in patients with chronic HF regardless of LVEF. Low iron status is associated with poor prognosis and may cause myocardial dysfunction and affect QoL. Treatment with ferric carboxymaltose has improved QoL and NYHA FC, and reduced the number of hospitalizations.

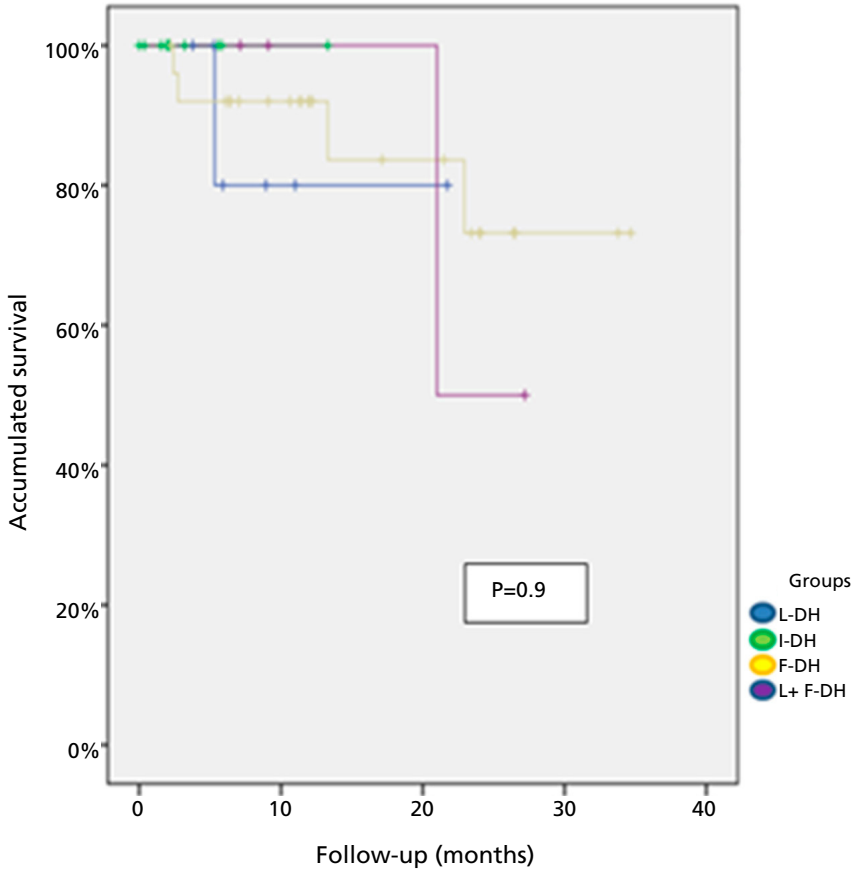
Table 2. Functional class (NYHA), functional capacity and quality of life in the different infusion groups

L-DH		(n=7) Baseline	6 months	P	I-DH		(n=26) Baseline	6 months	P
NYHA FC ≥ III (patients)		6	1	0.02	NYHA FC ≥ III (patients)		8	2	0.03
6MWT	DW (meters)	348±70	288±34	0.2	6MWT	DW (meters)	382±148	436±130	0.01
MLHFQ	Total	33±17	35±6	0.28	MLHFQ	Total	19±13	17±14	0.39
F-DH		**(n=10) Baseline**	**6 months**	**P**	**I-DH**		**(n=4) Baseline**	**6 months**	**P**
NYHA FC ≥ III (patients)		7	0	0.03	NYHA FC ≥ III (patients)		4	1	0.02
6MWT	DW (meters)	310±155	397±202	0.01	6MWT	DW (meters)	435±87	369±69	0.4
MLHFQ	Total	36±11	19±9	0.2	MLHFQ	Total	14±12	11±15	0.23

NYHA: New York Heart Association; 6MWT: 6-min walk test distance; DW: distance walked.
MLHFQ: The Minnesota Living with Heart Failure Questionnaire

Fig. 2. Number of HF hospitalizations, and survival curve

N hospitalizations	1 year pre-DH	1 year poste-DH	p
L-DH	19	7	0.03
I-DH	19	10	0.04
F-DH	36	11	0.03
L+ F-DH	4	4	1



DH: outpatient heart failure clinic; L-DH: levosimendan; I-DH: iron; F-DH: furosemide.

A statistically significant improvement in FC and 6MWT was observed in the I-DH group, together with a reduction in the number of HF hospitalizations, but no changes in QoL.

Intravenous loop diuretics are used in those HF patients with a wet and warm profile that is present in 80% of HF hospitalizations with reduced LVEF, and in almost all patients with preserved LVEF. Routine use of intravenous furosemide corrects volume overload and reduces the number of hospitalizations. (15) There is no solid evidence of a protocol design to achieve the objectives of that infusion. In the F-DH group, doses depended on the clinical assessment performed by the specialist at the beginning of the infusion. As in previous experiences, it was possible to achieve those objectives in our population. Finally, patients in the L+ F-DH group had a cold and wet profile, due to different causes including renal failure and arterial hypotension; they were not under OMT and had a greater number of comorbidities, which is probably why there was no reduction in the number of hospitalizations, but there was a FC improvement at 6-months after enrollment in DH.

Study Limitations

The small number of patients, due to the short period of analysis, and because a significant percentage of these patients are included in a heart transplant program. Outpatient follow-up is carried out by HF specialists, under a strict management approach according to the latest evidence.

CONCLUSION

Given that HF is a complex disease, multidisciplinary teams for a comprehensive approach on HF are required.

The evidence confirms that implementing organized interventions —such as units of heart failure and outpatient heart failure clinics— can change the present and future of this population.

Conflicts of interest

None declared.

(See authors' conflict of interests forms on the web/Additional material.)

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