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Original Research Article

Analysis of the Effects of Frusemide on Quality of Life in Patients of CHF

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Abstract

Aim: We performed the study protocol to investigate the efficacy and adverse effects of furosemide in patients with heart failure (HF).

Methods: Patients were enrolled in a consecutive prospective manner on a voluntary basis. Patients who were aged 18years and older with HF who were eligible to enroll in this randomized trial. All patients had evidence of left ventricular systolic dysfunction, confirmed by echocardiographic or nuclear imaging. The exclusion criteria were left ventricular diastolic dysfunction only, or receipt of medical or pharmaceutical care in other health systems.

Results: One hundred patients who met the inclusion criteria were included in our study.

Conclusion: In conclusion, our heart failure self-management program, designed for patients of all literacy levels, appears to reduce rates of hospitalization and death. Patients with low literacy, and other vulnerable patients, may stand to benefit most from these programs.

Keywords: furosemide, heart failure, protocol

Introduction

Heart failure (HF) is a widely prevalent clinical syndrome that has a huge burden on health care systems worldwide. [1] It approximately affects 1% to 2% of the adult population in developed countries, rising to greater than or equal to 10% of people greater than 70 years of age. [2] HF is characterized by several symptoms, including breathlessness, ankle swelling, and fatigue, and several signs such as jugular distension, pulmonary crackles, and peripheral edema. [3] It is usually the result of structural defects and/or elevated intracardiac pressures at rest or during stress. [4]

Diuretics are recommended to reduce fluid and sodium retention in the body and relieve the symptoms of HF. [3] A meta-analysis of clinical trials has concluded that in patients with chronic HF, loop and thiazide diuretics appear to decrease the risk of death and deterioration compared to placebo, and they also appear to improve exercise in comparison with active control. [5] According to the European society of cardiology (ESC) guidelines for diagnosis and treatment of HF, loop diuretics produce a more intense and shorter diuresis than thiazides, although they act synergistically. [3]

Furosemide is the most often used loop diuretic for HF. However, present data suggest potential pharmacologic and antifibrotic advantages with torsemide. [6] The bioavailability varies between 76% to 96% and 10% to 90% for torasemide and furosemide, respectively. [7,8] In addition, a longer duration of action and improved tolerability for torasemide over furosemide have been demonstrated in some clinical studies. [9,10]

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Methods

The present study was authorized by the local research ethics committee of Shanxi Cardiovascular Hospital (no. 48736645) and informed consent was obtained from all patients. Patients were enrolled in a consecutive prospective manner on a voluntary basis.

Patients who were aged 18year and older with HF who were eligible to enroll in the randomized trial. All patients had evidence of left ventricular systolic dysfunction, confirmed by echocardiographic or nuclear imaging. The exclusion criteria were left ventricular diastolic dysfunction only, or receipt of medical or pharmaceutical care in other health systems.

The dose of furosemide could be up titrated at follow-up visits if the patient did not respond to the treatment. Maximum doses allowed were 40mg/d for torasemide and 160mg/d for furosemide. Patients received the assigned treatment until the end of the study at week 32 (final visit).

The primary efficacy end point was the change in procollagen type I carboxyterminal peptide (PICP) serum levels between baseline and final visit. Serum PICP was determined by specific ELISA in a central laboratory. Secondary efficacy variables included parameters related to the clinical course of HF, such as body weight, presence of edema, signs and symptoms of HF, electrocardiogram and echocardiographic evaluation, amino terminal pro brain-type natriuretic peptide (NT-proBNP) serum levels measured by ELISA method, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate, and renal function.

Arterial BP was measured in the morning, after 10 minutes in the supine position, using a mercury column sphygmomanometer.

Additionally, incidence of cardiovascular events during the follow-up period of the study was monitored. The quality of life of the patients included in the study was measured using the Minnesota Living with Heart Failure Questionnaire.

Continuous and ordinal variables were expressed as a median (interquartile range). Categorical data were presented as a number of patients and percentages. Group comparisons were performed using the Fisher exact test for qualitative variables and t test for quantitative, normally distributed variables, and the Mann–Whitney U test for quantitative, non-normally distributed variables (normality of distribution was checked with the Shapiro–Wilk test). For all analyses, a P value of less than .05 was considered statistically significant.

Results

Table 1: One hundred patients who met the inclusion criteria were included in our study.

Characteristics	Efficacy Analysis (N = 100)
Sex	
Male	60
Female	40
Age (Y)*	61.7±8.8
Body weight (kg)*	74.5±10.8
Height (cm)*	166.9±7.9
Smokers, n	
No	85
Yes	15
Medical history, n	
Essential hypertension	60
Myocardial infarction	58
Chronic ischemic heart disease	55
Atrial fibrillation	
Cardiomyopathy	22
Cardiomegaly	35
Congenital heart disease	70
	30
Concomitant drugs, n (%)	
Analgesic	14
Antiarrhythmic, class Ill	0
Antiasthmatic	6
Antihypertensive	4
Antithrombotic	35
Beta-blocker	1
Calcium channel blocker	22
Converting enzyme blocker	50
Digitalis	70

Table 2: The effects of furosemide on measures of clinical outcomes

	Furosemide	P Value
SBP	147±23.1	<0.001
DBP	139.1±22.5	<0.001
Heart rate	77.9 ±10.8	0.0023
Body mass index	74.2±10.4	<0.001
Signs and symptoms of HF	87.4±10.5	0.002
Complications	90.0±11	<0.001

Discussion

Fluid overload is the primary cause of hospitalization among patients with HF.[15] Preventing circulatory congestion requires careful control of dietary sodium and chronic administration of oral loop diuretics. [16,17] When patients with HF deteriorate, it is often presumed that they have lapsed in their adherence to diet or to use of diuretics. Poor absorption of a diuretic, however, coupled with continuous sodium intake can also cause an inexorable accumulation of sodium and water. Cardiac remodeling is an indicative of a progressive course of HF. [18]

Hemodynamic load and many other factors can influence the status of cardiac remodeling. Therefore, drugs that decrease the load can contribute to preventing or slowing cardiac remodeling, and this is one of the primary aims of HF therapy.

Furosemide is a representatives of loop diuretics with an identical diuretic mechanism, but different pharmacokinetic properties and additional effects. Compared to furosemide, torasemide has greater bioavailability, a higher degree of protein binding, and a longer half-life. These properties make that torasemide works faster, longer, and less frequently causes rapid micturition than furosemide. According to previous studies, torasemide decreases rates of HF hospitalizations and hospital stay, improves exercise tolerance, quality of life, left ventricular function, cardiac sympathetic nerve activity, myocardial fibrosis, pulmonary congestion, peripheral edema, and blood pressure compared with furosemide. [13,19] However, the clinical evidence remains unclear. In this study, we aimed to compare clinical outcomes and adverse effects of therapy with furosemide in patients with HF.

Loop diuretics are administrated by dose-response curve. The initial dose of furosemide is 20 mg and can be increased up to 40 mg with maximum 600 mg daily dose, while initial oral dose of torasemide is 5to 10 mg up to 50 mg daily with maximum200 mg daily dose. [20]

When utilized in both diastolic and systolic patients, furosemide seemed to be more effective. However, there were only two open-labelled studies combined with a small number of patients (57 patients). [21]

Our sample size was small, which did not allow for an even distribution of baseline variables among the groups. We controlled for baseline differences between groups in our analysis. While it is controversial whether or not to control for baseline differences in randomized controlled trials, some analysts have argued that doing so improves the power without introducing bias. [22] A larger, multisitestudy would offer better control of confounders, better generalizability, and more power to determine differences in effect according to literacy. [23]

Conclusion

In conclusion, our heart failure self-management program, designed for patients of all literacy levels, appears to reduce rates of hospitalization and death. Patients with low literacy, and other vulnerable patients, may stand to benefit most from these programs. Further research into the design, implementation, and dissemination of disease management programs for low literacy patients will be crucial for meeting the health care needs of the growing population of patients with chronic illness.

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