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Original Article

Prognosis of emergency room stabilization of decompensated congestive heart failure with high dose lasix

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Abstract

Objective: Congestive heart failure (CHF) has become one of the most important health care problems in western countries. This article focuses on the outpatient diagnosis and management of heart failure. We want to compare the outcome of patients who were treated with high dose diuretics in the emergency department (ED) without admission with patients who were admitted to hospital for standard treatment.

Methods: This was a randomized prospective clinical trial study. The patients who came to the ED from March 20, 2008 up to August 20, 2008 were divided into two groups randomly. The length of ED stay in the experimental group was documented. Also, readmission and mortality in 6 months and satisfaction in both groups were taken into consideration. All data were analyzed using SPSS 15.0.

Results: In experimental group, the rate of recurrent admission, expiration, discharge, clinic visit, and clinic admission was 8%, 4%, 29%, 18%, and 0% respectively. On the other hand, in control group it was 16%, 40%, 18%, 22%, and 2% respectively. Additionally, there was a significant difference between these groups ($P=0.00$).

Conclusion: This study is the first regional prospective trial to comprehensively examine the therapeutic management in patients with CHF. This study, comparing the high dose diuretic efficacy in the decreasing of hospital stay and readmission; and decreasing mortality rate with routine therapy, showed that there was a significant difference between these two strategies in the mortality rate, readmission, and length of hospital stay ($P=0.00$).

Keywords: Aggressive therapy, Congestive heart failure, Diuretics

Introduction

Congestive heart failure (CHF) has become one of the most prominent health care problems in western countries. Increased prevalence of coronary artery disease (CAD), improvements in CAD, and hypertension treatment, and aging of the population are major factors that 1% to 2% of western populations suffer from CHF with a prevalence of 10% in the elderly (1,2).

Heart failure is a clinical syndrome, not a single disease entity that results from any number of structural or functional conditions that cause diminished blood flow and decreased tissue oxygenation. Patients who have heart failure may present both signs and symptoms of volume overload, and inadequate tissue perfusion, or neither of them. Because many patients who have the syndrome do not present volume overload, the term "heart failure" is preferred to the more limited term CHF (3).

Two terms have ultimately emerged to define these patients. The term "acute decompensated heart failure" is used variably but usually describes those patients with known heart failure who experience acute or subacute deterioration of their heart failure state (4,5). The term "acute heart failure syndromes" emerged from 2004 and 2005 meetings of an international workgroup which convened primarily to predict uniform terminology and definitions in heart failure (6). The workgroup defined acute heart failure syndromes as the "gradual or rapid deterioration in heart failure signs and symptoms resulting in a need for urgent therapy" (6). The consensus document further stated that these symptoms are primarily manifested from increased pulmonary density that result from elevated left ventricular filling pressures (with or without low cardiac output) and may occur in patients with normal or reduced left ventricular ejection fraction (6). The emergency de-

partment (ED) plays a serious role in the handling of acute heart failure syndromes since approximately 80% of hospitalized patient for the condition are admitted through the ED (5). Heart failure is progressive, and after recognition of the syndrome, patients experience greater morbidity and have more frequent encounters with the health care system. Heart failure results in an enormous cost to society in terms of morbidity, mortality, and health care expenditure. In 2005, the direct and indirect costs of heart failure were expected to reach $30 billion (7). The prevalence of heart failure is likely to increase with aging of the population and improved survival after myocardial infarction (MI). This article focuses on the outpatient diagnosis and management of heart failure. We want to compare the outcome of patients who are treated with high dose diuretics in the ED without admission with patients who are admitted to the hospital for standard treatment.

Methods

This was a randomized prospective clinical trial study to compare two strategies in the treatment of CHF. All patients who came to the ED with a diagnosis of CHF, from March 20, 2008 up to August 20, 2008 were divided into two groups randomly. The length of ED stay in the experimental group was documented. Also, readmission and mortality in 6 months and satisfaction were recorded in a prepared form. The patients who had a history of CHF, those who were diagnosed with the physical exam, a chest x-ray, and echocardiography by the ED cardiologist were included in this study. The inclusion criteria was the exacerbation of CHF in II < NYHA. The patients with noncardiac dyspnea and acute coronary syndrome were excluded. The patients were divided into two groups. The control group was admitted to hospital wards and got routine treatment and the experimental group took the observation room in ED and got high dose lasix (higher than 100 mg). If patient's blood pressure (BP) > 100 we added trinitroglycerin (TNG) and captopril. Captopril dose increased to maximum (attention to tolerance). If patient's BP < 100 we used inotropes too. We discharged the patients when (*a*) patients felt well; (*b*) patients could change position without orthostatic changes; (*c*) the rest pulse rate was lower than 100; (*d*) BP ≥ 85; (*e*) urinary output ≥0.5 cc/kg/h; (*f*) O_2 sat was higher than 90% in the room air; (*g*) cardiac troponin was lower than 0.1 ng/cc; (*h*) patients did not have any chest pain; and (*i*) patients did not have arrhythmia. Lasix dose in aggressive therapy in the experimental group started with 100 mg lasix and continued at a rate of 3-10 mg/h. We also we checked electrolytes.

Data

Rehospitalization and death in 6 months were followed up by phone or clinic visits and the satisfaction rate was documented as well.

Data Analysis

All data were analyzed using SPSS version 15.0. Rates, means and standard deviation were used in order to present the descriptive data. In order to compare the experimental and control groups, chi-square and Student's t-distribution were applied.

Result

In this prospective clinical trial, the mean age in the experimental and control groups were 67.4±13.5 and 68.1±12.2 respectively ($P = 0.793$). Fifty six percent of patients in the experimental group were males and 44% were females. But this rate among males and females in the control group was 52% and 48% respectively ($P = 0.688$).

The frequency of dilated, diastolic, and ischemic cardiomyopathy is shown in the Table 1.

Eleven, 23, and 16 patients in the experimental group stayed in the ED lower than 6 hours, 6 to 12 hours, and more than 12 hours respectively.

This shows that, there was a significant difference between routine treatment and aggressive ED therapy; and the outcome was better in aggressive ED group (Table 2). The satisfaction between these two groups did not have a significant difference ($P = 0.058$; Table 3).

Discussion

This study is the first regional prospective trial to comprehensively examine the therapeutic management in patients with CHF. There are several unique aspects for this study: (*a*) it compares two treatment strategies; (*b*) the two strategies have clearly defined goals to reduce symptoms to NYHA ≤ II; (*c*) it includes a comprehensive analysis of

Table 1. The frequency of cardiomyopathy

	Dilated cardiomyopathy	Diastolic dysfunction	Ischemic cardiomyopathy	*P*
Experimental	14 (28%)	7 (14%)	29 (58%)	0.134
Control	21 (42%)	10 (20%)	19 (38%)	

Table 2. The outcomes in a six month follow up in both groups

	Recurrent admission	Expired	Discharged	Outpatient treatment	Outpatient and admission	*P*
Experimental	1 (8%)	2 (4%)	29 (58%)	18 (36%)	0 (0%)	<0.05
Control	8 (16%)	20 (40%)	9 (18%)	11 (22%)	2 (4%)	

Table 3. Rate of satisfaction in both groups

	Great	Good	Average	Poor	*P*
Experimental	3 (6%)	38 (76%)	9 (18%)	0 (0%)	0.058
Control	0 (0%)	32 (64%)	16 (32%)	2 (4%)	

the hospital stay because the long length of stay due to high hospitalization rates and long-term dependency represent a major health care problem; (*d*) it includes the rate of death in a 6 month follow up; and (*e*) it shows the satisfaction of these two treatment strategies. Besides these primary study objectives, the data collected will provide important information on less well known issues about CHF. Decompensated heart failure can be a complex treatment problem. Aggressive heart failure management protocols instituted in the observation unit have led to improved patient outcomes and reduced hospital admission rates (8,9). Observation unit treatment protocols for patients presenting with acute decompensated heart failure include the implementation of diagnostic and therapeutic algorithms, cardiology department consultations, aggressive nursing monitoring, detailed patient education, and follow-up arrangements made at discharge (8,10). Patients treated according to these protocols have benefited from lower 90-day ED revisit rates and decreased rates of rehospitalization (8). Although discharge evaluation is unique to each heart failure patient, ED observation unit discharge is appropriate only when certain basic criteria are met. For example, the patient should get an adequate response to diuretic therapy, as evidenced by a total net urine output of more than 1 L, and cardiac biomarkers should be within normal ranges. The patient should also have a stable electrolyte profile and no new clinically significant arrhythmias, be ambulatory, and have a systolic blood pressure more than 95 mm Hg, and a resting pulse rate of less than 100 beats/min (9). Although no clinical trials exist to determine their effects on mortality, diuretics persist as the mainstay of symptomatic treatment for heart failure. The reason is simple: heart failure is presented as a hypervolemic condition; therefore achieving euvolemia should improve symptoms. Thiazide diuretics are appropriate for patients who have mild symptoms, but most patients who have heart failure require loop diuretics. Diuretics are indicated in all patients who have heart failure and who have signs of hypervolemia. For most outpatients who are diuretic-naıve, furosemide 20 mg to 40 mg (or its equivalent) once daily is a reasonable starting dose (11). The dose of diuretic should be adjusted so that symptoms of hypervolemia are controlled while maintaining hemodynamic stability, renal function, and electrolyte balance. This tends to be an individualized trial-and-error (or trial-and-success) process. Diuretic resistance may result from several causes: progression of heart failure, excessive dietary sodium consumption, nonsterioidal anti-inflammatory drugs (NSAIDs), or anything else that reduces renal perfusion (11,12). If diuretic resistance is encountered, the first step is to increase the dose. The usual maximum single oral dose of furosemide is 200 mg to 250 mg, or an equivalent dose of torsemide or bumetanide could be employed. Because the half-lives of loop diuretics are on the order of hours, frequent dosing may increase total daily diuresis (12). The concurrent use of an Angiotantion Enzyme Convector (ACE) inhibitor or aldosterone antagonist may facilitate diuresis (13). In the clinical study that recruited patients with severe pulmonary edema and moderate-to-severe respiratory distress, Cotter et al (14) reported reduced rates of the composite outcome of hospital death, MI, and intubation among the patients receiving higher-dose nitrate therapy in the out-of-hospital setting. In this study, 104 patients with acute heart failure syndrome were randomized by physicians working in the field with emergency medical services to get either low-dose furosemide and high-dose nitrates or high-dose furosemide and low-dose nitrates. Most of the study subjects had a history of chronic heart failure, and there were no patients included with acute ST-elevation MI. All enrolled patients had rales on chest examination and a room air pulse oximetry of less than 90% when sitting upright. One study arm used high-dose nitrates (8-fold difference between study arms) and the other arm used high-dose furosemide (4-fold difference between study arms). The combined endpoint of hospital death, MI within 24 hours, and intubation within 12 hours was significantly lower in the high-dose nitrate group (25% versus 46%; $P=0.04$). The most significant was the endotracheal intubation rate difference within the first 12 hours, with the high-dose nitrate treated patients requiring much less intubation than those receiving high-dose furosemide (13% versus 40%, $P=0.005$). Additionally, significantly more patients were diagnosed with MI within the first 24 hours of admission in the high-dose furosemide group than the high dose nitrate group (37% and 17%, respectively, $P=0.05$) (15). Observation unit strategies for the management of acute decompensated heart failure must result in reductions in hospital admissions and in the costs associated with the care of heart failure patients. Although recent improvements in therapeutic options, including the regular use of ACE inhibitors and b-blockers have improved the prognosis for many patients with heart failure, episodes of severe decompensated heart failure do occur, requiring therapy that results in rapid symptomatic and hemodynamic stabilization. Lasix in the observation unit has been proven to be safe and efficacious inpatients with acute decompensated heart failure (16). In this study, we can find; (*a*) two groups were chosen randomly and the age, sex, and kind of heart failure was the same; and we excluded the patients with cardiogenic shock, BP dropped and ACS (*b*). The key of this study was the high dose of Lasix in the experimental group. Some studies have stated that it can be effective in the HF survival but they cannot say it definitely. On the other hand, the use of spironolactone make survival better in the chronic heart failure but there were not any studies about diuretics in acute HF. In this study, high dose of lasix used in a short time may decrease readmission and mortality by remodeling of heart chambers and changes

in the control system of epinephrine and RAS (3). Unfortunately, from the start of this study we could not check the brain natriuretic peptide (BNP) and proBNP, but if we could do this; an observation of some changes in the neurohormonal systems could be discerned (4). The number of patients to show a difference between these strategies to decrease mortality rate was enough, but to check it better some more studies are needed (5). Comparing the high dose diuretic efficacy in decreasing hospital stay and readmission and decreasing mortality rate with routine therapy, showed that there is a significant difference between these two strategies in the mortality rate and readmission and length of hospital stay ($P=0.00$).

Conclusion

According to this article, we found that, aggressive therapy of decompansative CHF can decrease the hospital stay and save the wards bed to more needed patients. This can also increase satisfaction by decreasing costs, saving time, reducing readmission and finally increasing the prognosis.

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Ethical issues

The study was approved by the local ethic committee. We completed the informed consent form for all patients in the experimental group.

Authors' contributions

All authors contributed equally to this article.

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