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Original Article

6-Minute Walk Test for Prediction of Heart Failure in Stable Outpatients

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ABSTRACT

Background and Objective. Heart failure (HF) is becoming an increasingly serious public health issue. The six-minute walk test (6-MWT) is a useful tool for determining the prognosis of HF patients. Due to a lack of research on their predictive relevance in 6-MWT, the goal of the study was to see if 6-MWT was indeed beneficial as a predictive indicator of death in patients with mild-to-moderate congestive heart failure. **Methods.** Secondary data was employed in this investigation. The 6-MWT was used to divide the walking lengths of 45 individuals with HF into two performance levels: Group I ≤300 m and Group II >300 m. All of the patients had left ventricular systolic dysfunction (ejection fraction, 38.23 ±7.348) and were in stable New York Heart Association functional classes II (91.1%) and III (6.7%) heart failure, respectively. Data were analyzed using SPSS. log-rank test was used for comparison of the 2 curves. **Results.** The current findings reported that the risk of death was significantly higher in patients whose 6MWT distance (6MWTD) was ≤300m, as compared to patients whose 6MWTD was >300m (Cox regression model). The fatality rate was significantly lower in patients with a 6MWTD of ≤300 m, compared to patients with a 6MWTD of >300 m. **Conclusions.** According to the findings, a 6MWTD of less than 300 m is useless as a predictive indication of death in patients with mild to moderate congestive HF.

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INTRODUCTION

Heart failure (HF) is a growing public health concern that has a significant economic impact on society [1]. The inability of the heart to pump enough blood to meet the demands of the body is known as heart failure [2]. A sub-maximal exercise test is the six-minute walk test (6-MWT), an effective tool for determining the prognosis of individuals with mild to moderate congestive heart failure. One of the most powerful markers of mortality in HF is the left ventricle ejection fraction. Most studies concluded that "the 6MWT indicate to be a predictor of mortality and hospitalization for individuals with chronic heart failure, as well as this test demonstrate to be an independent predictor of morbidity and death" between 1993 and 2006 [3,4].

The 6MWT has been proposed as a simple, safe, and low-cost substitute for cardiopulmonary exercise testing [5]. According to previous studies, the 6-minute walk distance (6MWD) offers substantial predictive significance in individuals with chronic heart failure (CHF) [3]. Indeed, a 6MWD of less than 300 m was linked to a greater 1-year death rate [6]. Earlier report found that 'The six-minute walking test identifies patients with a significantly higher risk of death less than 200 m [7].

Numerous studies have looked at the prognostic value of 6MWT in stable patients with chronic HF; however, there are significant inconsistencies in the associations found in these studies, which could be due to changes in study design, 6MWD cut-off values, population disparities, etc. Lower 6MWT performance has been linked to increased mortality, nonfatal cardiovascular events, and HF hospitalizations in patients with HF with reduced ejection fraction, primarily in groups with mild-to-moderate HF [1]. The prognostic value of 6MWT in terms of morbidity and mortality has been previously studied in HF populations, particularly in NYHA classes II–III.
In contrast, only a few earlier research found that 6MWD had little predictive value in HF patients [8,9]. The majority of research that reveal a prognostic role concur that a 6MWD of less than 300 m indicates a bad prognosis [10]. Patients with stable HF who have a 6MWD of less than 200 m may be identified as having a significantly higher risk of death [11]. Although this was not a consistent finding in all previous research, decreased 6MWD has been demonstrated to be one of the greatest independent predictors of long-term mortality and HF hospitalizations in individuals hospitalized for acute HF [12]. Although this was not a consistent finding in all previous investigations, decreased 6MWD has been demonstrated to be one of the strongest independent predictors of long-term mortality and HF hospitalizations in patients hospitalized for acute HF [13]. Therefore, the objective of this study was to determine whether 6-MWT is truly beneficial as a predictive indicator of death in HF patients.

METHODS

This study incorporated all previously collected secondary data and included 45 patients with HFs (8 women and 37 men) as a result of a 6-MWT. The average age was 63 ± 10 years, including the results of patients who were followed for five years, as well as all patients with stable chronic heart failure secondary to ischemic heart disease or idiopathic cardiomyopathy, as defined by the New York Heart Association (NYHA). All patients were undergoing treatment for stable HF with angiotensin-converting enzyme inhibitors for at least 4 weeks and with diuretics for at least 2 weeks.
In cardiac rehabilitation groups, all patients did 20 minutes of aerobic exercise three times per week. All patients who completed the 6-MWT were included in the study. Patients were divided into two groups based on their walking distance: Group I (300m) and Group II (>300m). Between the 15th of February 2000 and the 1st of September 2010, the patients were followed for 5 years in terms of cardiovascular death. Statistical analyses were performed using SPSS 17.0 (IBM Inc., Chicago, IL, USA). Variables were presented as mean ± standard deviation, and percentages.

RESULTS

Table1 summarizes patients' clinical characteristics. The Cox proportional hazards regression model was used to estimate the relative risk of cardiovascular death. Other variables used to determine basic risk were LVEF ≤0.30, age over 65 years, and ischemic cause of HF.
Risk ratios were determined with 95% confidence intervals, according to the Cox regression model as show below in (Table 2). Cardiac death curves were obtained by the Kaplan- Meier method. The log-rank test was used for comparison of the 2 curves. A value of P <0.05 was considered statistically significant.

Table 1. Clinical Characteristics of Patients

Clinical Characteristics	Values
Number of patients	45
Mean age (yr)	63.24 ± 9.978
Men (%)	82.2
Women (%)	17.8
Cause **Ischemic heart disease (%)** **Dilated cardiomyopathy (%)**	 48.9 2.2
New York Heart Association class (%) II	91.1
New York Heart Association class (%) III	6.7
Left ventricular end-systolic diameter (mm)	44.00 ± 13.044
Left ventricular ejection fraction	38.23 ± 7.348
Diabetes mellitus (%)	8.9
Systemic hypertension (%)	26.7
Smoker (%)	2.2
6-Minute walk distance (m)	375.00 ± 84.303
Follow-up (mo)	37.48±16.053

Table 2. Cox Proportional Hazards Regression Model for Death

Variable	Adjusted Hazard Ratio	95.0% CI	*P* Value
Age	1.601	480-5.336	0.443
LVEF	3.725	217-64.09	0.365
6-MWT	1.476	348-6.256	0.598
Ischemic cause	8.370	609-115.001	0 .112

CI = confidence interval; LVEF = left ventricular ejection fraction

Patients with a 6MWTD of ≤300 had a significantly higher risk of death than patients with a 6MWTD of >300 m. (Cox regression model). Furthermore, old age and ischemic heart failure were statistically significant in terms of risk of death (P >0.05). The mortality rate was significantly lower in patients with a6MWTD of ≤300m than in patients with a 6MWTD of >300 m, as shown in figure 1.

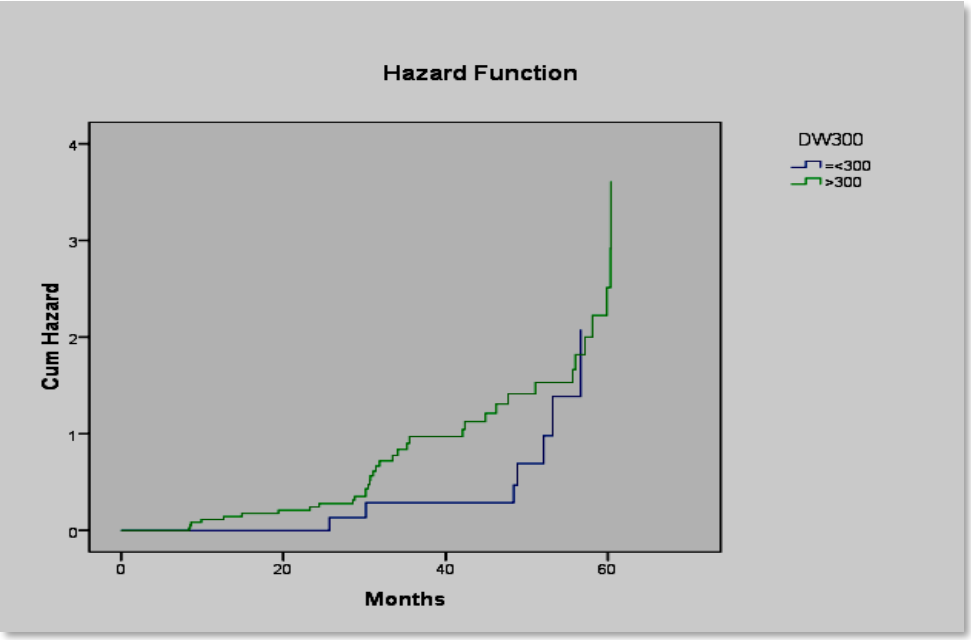

Figure 1. Kaplan-Meier curve for the 6-MWT, according to the distance walked

DISCUSSION

In the study by Rostagno and associates[19] of 214 patients with mild-to-moderate heart failure, the mortality rate for patients whose 6MWT distance was <300 m was significantly higher than that for patients whose 6MWT distance was ≥300 m. They concluded that a 6MWT distance of <300 m is a "simple and useful prognostic marker of subsequent cardiac death in unselected patients with mild-to-moderate congestive heart failure.

In a study of 214 patients with mild-to-moderate heart failure conducted by Rostagno and colleagues found that the mortality rate for patients whose 6MWT distance was 300 m was significantly higher than that for patients whose 6MWT distance was 300 m. They concluded that a 6MWT distance of 300 m is a "simple and useful predictive marker of eventual cardiac death in unselected mild-to-moderate congestive heart failure patients" [6].

Cahalin and colleagues looked at 45 patients who had been referred for a heart transplant examination. A 6MWT distance of 300 m predicted a higher risk of mortality or hospitalization for inotropic or mechanical support within 6 months, but it failed to predict overall or event-free survival after a 62-week follow-up [6]. The findings of this study, on the other hand, reveal that a walking distance of 300 meters during the 6MWT is an independent predictor of death in mild-to-moderate heart failure patients. While, in another study, they found that patients in NYHA classes III and IV had a 50% chance of survival, which was significantly higher than patients in NYHA classes I and II. The death rate in NYHA class III and class II patients was also significantly higher in our study [3].

In patients with heart failure, the left ventricular ejection fraction (LVEF) is one of the most powerful predictors of death [14,15]. Lower left ventricular ejection fraction is an independent predictor of death, according to the findings of this study. Andersson and colleagues found that the death rate in heart failure caused by ischemia was higher than the mortality rate in heart failure caused by other causes in 2,711 individuals [16]. Ischemic

heart failure was also associated with a greater mortality rate in this study. This could be due to the small number of included patients.

Clinical trials using angiotensin-converting enzyme inhibitors and beta blockers found no meaningful improvement in 6MWD in the majority of investigations. In the majority of studies using cardiac resynchronization therapy, however, the 6MWD was improved. In fact, a lower 6MWD (350 m) might identify a group of patients that benefited the most from cardiac resynchronization therapy, as evidenced by a considerable drop in mortality [17].

CONCLUSION

The expected outcomes from this study had not been achieved, therefor; the study hypothesis: '6-MWT distance of ≤300 m is a simple and useful prognostic marker of subsequent cardiac death in stable NYHA functional class II and III patients with mild-to-moderate HF' was disproved. Changing the 6-minute walking test to a time and distance standard would increase the efficiency of the test while retaining the bulk of the forecasts.

Competing of interest. Nil

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