ORIGINAL ARTICLE

Distance of 6-Minute Walking Test in Acute Myocardial Infarction and Its Influencing Factors

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ABSTRACT

Objectives: To know the result of a 6 minute walking distance (MWD) test in patients with acute myocardial infarction, characteristic of the subjects and the relationship between the 6 MWD test and factors such as age, body weight, body height and type of the infarct.

Methods: The subjects of this study were stable acute myocardial infarction patients. Baseline data which included age, body weight, body height, blood pressure, heart rate, saturated oxygen, dyspnea scale measured with modified Borg scale and chest pain (numeric rating scale) were collected before doing the 6MWD test. After doing the test without warming up, the blood pressure, heart rate , oxygen saturation, dyspnea scale (Borg scale) and chest pain (numeric rating scale) were recorded.

Results: From 49 subjects enrolled in this study, three dropped out (n=46). The mean of 6 MWD test was 208.50 (100-400) meter or 44.31% from predicted. There was a correlation between distance of 6 MWD test and body height with r = 0.302 ; p=0.04 ($p<0.05$) and also between female gender and type of infarct which was NSTEMI with β= -92.3 ; p= 0.02 ($P<0.05$) and β = -77.044; p= 0.01($p<0.05$).

Conclusions: The mean distance of 6 MWD test was 208.5 m. There was significant correlation between body height, female gender and NSTEMI type of infarction.

Keywords : *6 minute walking distance test, distance of 6 minute walking, functional test, acute myocardial infarction.*

INTRODUCTION

In 2004, there were 16.000 patients suffering from heart disease and half of them were acute myocardial infartion.[1,2] Patients who survived from acute myocardial infarction, were suffering loss of confidence and had functional limitation in the activity of daily living. [3-5] The success of medication intervention in patients with acute myocardial infarction can be measured from the functional capacity.[4-7] The simple stress test which was to know the functional capacity of the patient after suffering myocardial infarct was the sub maximal test.[8]

The six minute walking test has already been used worldwide for patients who have functional limitation like chronic obstructive pulmonary disease, heart failure, and pulmonary hypertension. [9-11] From the recommendation of American Heart association, the six minute test can be done 2 weeks after the acute myocardial infarction. But from the study by Noeriega et al.[12], the test can be done 1 week after acute

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myocardial infarction. From that study, we also know that the 6 minute walking test can be done safely one week after acute myocardial infarct.

The purpose of this study is to know the distance covered in the 6 minute walking distance test by the patient after acute myocardial infarction in both types: Non ST Elevation Myocardial Infarct (NSTEMI) and ST Elevation Myocardial Infarct (STEMI) and the factors which influence the result of distance such as age, sex, weight, height and the type of the infarct.

METHODS

Forty nine patients with stable acute myocardial infarction hospitalized in Cipto Mangunkusumo Hospital from May to July 2008 were enrolled in this study using consecutive sampling. The diagnosis of acute myocardial infarction was established according to World Health Organization (WHO) criteria. All of the patients should have reached a stable condition after getting medication like thrombolitic and standard therapy from the internist or cardiologist. Patients having undergone invasive therapy were not included in this study.

Exclusion criteria was follow: acute myocardial infarction which was not stable yet, acute myocardial infarction with arrhythmia, chronic obstructive pulmonary disease (COPD), heart failure grade III-IV, unstable angina, acute myocardial infarction with having undergone percutaneous coronary intervention and have had bypass surgery, a heart rate more than 120 times per minute, blood pressure $\geq$ 180/100 mmHg, oxygen saturation less than 90%.

Drop out criteria: A chest pain more than 3 according to Numeric Rating Scale, dyspnea more than 3 according to the modified Borg scale, symptomatic muscle spasm of lower extremities, cannot walk straight, dizzy, pale, the patient can't walk any more and wants to stop, oxgygen saturation drop to less than 90%.

Before the test, the procedures, including the risks, were explained and written informed consent (as approved by the institutional medical ethics committee) was obtained from all of the patients.

The 6 minute walk distance test was conducted by doctor (investigator) according to current standards in a 30 meter internal corridor. The test was performed once on the same day that the patient was discharged from hospital. The investigator encourages the participant with a standardized statement (according the American Thoracic society). Participants were allowed to stop and rest during the test, but they instructed to resume walking as soon as they are able to do so. Before and after the test investigator measured the weight, height, blood pressure, heart rate, oxygen saturation, modified Borg scale, and chest pain numeric rating scale.

Data are expressed as the mean, median and standard deviation (SD). Normalization data using one sample Kolmogorov-Smirnov, Pearson correlation to know relationship between two variables, and finally using multi variant linier regretion to know the predictor.

RESULTS

The participant number enrolled in this study was 49, three of them were dropped out from the study . One of them refused to continue the study, one had decreased oxygen saturation, and one had dyspnea more than 3 according to modified Borg scale. Subjects' characteristics can be seen in table 1.

Table 1. Characteristic of the Subjects

Social Demographic Characteristic	n= 46
Age	59.17 ± 8.39
Sex	
Male	30 (65.2%)
Female	16 (34.8%)
Education	
Not graduate elementry school	5 (10%)
Graduate elementry school	8 (17.4%)
Graduate middle school	3 (6.5%)
Graduate high school	19 (41.3%)
Graduate academy / university	11(23.9%)
Job	
Public service	19 (41.3%)
Private sector	10 (21.75%)
Labor	5 (26.1%)
Not working	6 (10.9 %)
Weight (kilogram)	60.54 ± 8.175
Height (cm)	159.13 ± 6.177
Type of infarct	
STEMI	15 (32.6%)
NSTEMI	31 (67.4%)
Location of infarct	
Anterior	2 (4.3%)
Posterior	3 (6.5%)
Inferior	9 (19.6%)
Lateral	4 (8.7%)
Anteroseptal	27 (58.7%)
Inferolateral	1 (2.2%)

mean ± SD (standard deviation)

The average distance of six minute walking test after acute myocardial infarction is 208 meter (100-400 meter) or 44.32± 14.58 % from prediction.

Table 2. The distance of 6 minute walking test and prediction of distance in patients after acute miocardial infarct in Ciptomangunkusumo Hospital

Result 6 minute walking test	n = 46
Distance (meter)	208.50 (100-400)
Presentation of distance (%)	44.32 ± 14.8

mean±SD for normal data ; median (minimum-maxsimum) for abnormal distribution data

The result of the distance had a positive correlation with height according to Pearson correlation with r = 0.302 ; p = 0.04 (p<0.05), in the other hand, age and weight had no correlation according to Pearson correlation.

Table 3. Correlation between age, weight, height and the distance of six minute walking test in acute myocardial infarct

Variable	R	P
Age	-0.113	0.456
Weight	0.034	0.825
Height	0.302	0.04

r= correlation; p<0.05

Using multivarian linier regression analysis, there was negative correlation between the distance of 6 minute walking test and female gender. It was found that female subjects had a shorter distance of six minute walking test than males. There was also negative correlation between distance of 6 minute walking test with type of the infarct. We found that subjects with NSTEMI infarct have shorter distance than STEMI.

Table 4. Coeffisien linier between the distance of six minute walking test and age, sex, weight, height in patient after acute myocardial infarct

Variable	B	95% CI		P
		Upper Limit	Lower Limit	
Age	-1.06	-3.9	1.78	0.46
Sex				
Female	-92.3	-148.1	-36.4	0.02
Weight	0.33	-2.6	3.27	0.825
Height	3.87	0.16	1.59	0.041
Type of infarct				
NSTEMI	-77.04	-111.2	-34.9	0.01

β = power; 95 % CI= Confidence interval; p = correlation between 2 variables p< 0.05

DISCUSSION

The data was collected from May to July 2008 in Cipto Mangunkusumo Hospital. The number of participants enrolled in that period was 49 patients. Three of the patients dropped out because, one patient refused to continue the study, one patient drop out because of the dyspnea more than 3 according to modified Borg scale, and the other one had oxygen saturation less than 90% after recovery from lung oedema. Almost all patient were recruited from the intensive cardiac care unit (ICCU). After the patients reached a stable condition and was planned to be discharge from hospital the patient started the 6 minute walking test.

Because almost all the subjects were recruited from ICCU, we found out that patients having acute myocardial infarct, felt difficulty in movement. Almost every patient stopped in the middle of the test because they were very affraid and felt insecure, but after one turning the patient fell more confident to walk and almost all patients finished the test. Because of that difficulty, we started the early mobilization in ICCU before beginning the six minute walking test. When the patient was about to be discharged from hospital and they were ready, we conducted the six minute walking test.

The American Thoracic Society recommended that the six minute walking (6MWD) test be conducted 2 weeks after the acute infarct.[15] But from this study, we found out that one week after acute infarct the patient who were stable could do the test safely without any serious complication. In this study 94 % patient were able to complete the 6 minute walking test with average numeric rating scale (NRS)1-2 (mild); one patient suffering chest pain with numeric rating scale chest pain 3 (mild). This study showed the same result as the study by Noguera et al (2006). [12] They concluded that 6 MWD test was safe after 1 week of infarction and also found out that the NRS and dyspnea symptom were mild (1-3).[12]

From this study, we know that the 6 MWD test was easy and safe to measure the functional capacity in patients who have limitation. We also found out that after having acute myocardial infarction, patients were experiencing difficulty in mobilization because of being afraid and unsecured.

The average distance of 6 MWD test in this study was 208 meters or 44.31 % from the predicted distance. In study by Nogueira et al.

[12], the average distance was 535 meter or 94.3 % from the predicted distance which is much higher than from our study. They included the patients who had undergone invasive intervention such as percutaneous coronary intervention but in this study subjects who had undergone invasive interventions were excluded. The other reason is not all the subject had early and proper mobilization in ICCU. The distance of 6 MWD test was the same with distance of the heathy geriatric. In this study, we could not compare the result because there is no data about the healty people geriatric population in Indonesia.

There was a positive correlation between the distance of 6 MWD test in acute myocardial infarction patients and their height. The reason is that the length of the lower extremities will influence the step length of the patient. This conclusion was also found in the study by Enright et al.[22] which found out that the height had a correlation with the distance.[13] There was no correlation between the the distance of 6 minute walking test and body weight or age. In the study by Enright at al and by Bautmans et all, beside the height, they also found out correlation between the distance of 6 minute walking test with age.[22,39] In their studis, they used healthy people participants with average age more than 65 year.[22,39] In this study, the participants age was between 39 to 75 year. In our study, body weight has no correlation with the distance, although theoretically the weight will influence the distance.[19] Study by the Opascih[23] and Enright et all[24] had the same result. They conducted the 6 MWD test in patients with acute myocardial infarct after heart surgery.

The sex (female) had a negative correlation with the distance of 6 MWD test in which they had shorter distance compared to the male. This result matched with the American statistic and Monica study (Jakarta 2000) which found that men have more activity than women.[1,2] This will influence the strength of men's muscle which further improve the distance of 6 MWD test. Beside of that, women usually have shorter height than men and that will also affect the step length and moreover the distance.[1,2] This result also matched with the study by Enright et al [22] and by Opasich et al [23] although they used different populations.

In this study, type of the infarct have a correlation with the distance of 6 MWD test. The distance of NSTEMI patients were shorter compared to the STEMI patients. This can happen because. NSTEMI have many underlying causes that the response of the therapy will show different results, depending on the underlying cause and risk factors. [5,6]

CONCLUSIONS

Average distance of the six MWD test was 208.5 (100-400) metres or 44.31% from the predicted distance. The distance of 6 MWD test in acute myocardial infarction have a positive correlation with the height but have negative correlation with the female gender and the type of the infarction (NSTEMI).

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