RELEVANCE OF SIX MINUTE WALK TEST IN CLINICAL PRACTICE

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ABSTRACT

BACKGROUND

6-minute walk test is an important objective test of exercise tolerance in cardiorespiratory symptomatic.

MATERIALS AND METHODS

We have chosen 250 symptomatic patients presenting to Katuri Medical college department of Pulmonary Medicine with symptoms of breathlessness. Among them 230 patients were followed up with 6-minute walk distance at the time of admission in to the study, at the end of 1 week 2 weeks and 4 weeks of treatment.

RESULTS

Improvement was seen in 6 MWD after 2 and 3 weeks of therapy.

SUMMARY AND CONCLUSION

6 minute walk test is a very useful test to assess qualitatively the effort tolerance in cardiorespiratory symptomatics. It is cheap and can be done in Primary care settings. Can assess a patient at the time of diagnosis, assess improvement in therapy, desaturation with exercise and can be useful to assess surgical fitness.

KEYWORDS

6 MWD (6 minute Walk distance), COPD, Interstitial Lung Disease, Pulmonary Fibrosis, Cardiopulmonary Exercise Testing.


INTRODUCTION

Six minute walk test is a very useful and simple affordable test to assess respiratory and cardiovascular patients even at primary healthcare level. This test does not require any costly equipment and the information obtained from this test is enormous and comparable to any complicated investigation. Six minute walk test can be used for assessing patients for cardiovascular diseases, respiratory diseases like interstitial lung diseases, pulmonary fibrosis, pulmonary arterial hypertension and all other diseases associated with breathlessness as a symptom at the time of diagnosis and to assess response to treatment.

We can also use this test for patients suffering from breathlessness namely chest wall deformities, kyphoscoliosis, neuromuscular and muscular diseases. It can also be utilized for assessment of patients for fitness for surgery.

AIMS AND OBJECTIVES

To study the relevance of six minute walk test among respiratory symptomatic with breathlessness.

To assess six minute walking capacity among respiratory symptomatics at time of registration and periodic assessments of walking capacity and to assess response to treatment.

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2. Baseline heart rate and oxygen saturation (SpO2) by pulse oximetry are measured.
3. Patient’s baseline dyspnea and overall fatigue are measured using the Borg scale.
4. The timer is set to 6 minutes and walking laps are counted manually.
5. The patient is positioned at the starting line. As soon as the patient starts to walk, the timer is started. Post-test: Postwalk Borg dyspnea and fatigue levels are recorded.
6. Pulse oximeter to measure SpO2 and pulse rate.
7. The number of laps are counted manually.
8. The total distance walked is measured rounding to the nearest meter, and recorded including the half laps.

**Inclusion Criteria**
Patient having respiratory symptoms with breathlessness and diagnosed to have bronchial asthma, COPD, Interstitial lung disease and Pulmonary fibrosis are included in the study.

**Exclusion Criteria**
1. Patients of pulmonary tuberculosis.
2. Patients of lung cancer.
3. Patients of other co-morbid systemic illness.
4. Debilitated Patients.

**RESULTS**
Of 250 respiratory symptomatic patients coming to Katuri medical college 230 patients were under regular follow up, 20 patients didn’t come for follow up. Among them 177 were males and 77 were females.

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>153</td>
<td>77</td>
<td>230</td>
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*Table 1*

Initial six minute walk distance of the patients were measured at the time of inclusion into the study. They ranged from 50 to 400 meters.
12 patients walked from 50 to 99 metres.
86 patients walked 100 to 199 metres.
74 patients walked a distance of 200 to 299 meters.
50 patients walked from 300 to 399 meters and.
8 patients above 500 distance in meters respectively.

We followed the patients periodically initially and at the end of 1st week of treatment, 2nd week of treatment and 4th week of treatment and measured the 6-minute walk distance.

**At the End of 1st Week**
At the end of first week less than 9% improvement 6 Minute Walk distance was seen in 41 patients (17.83%).
10 to 19 percent improvement was seen in 89 patients (38.69%).
20 to 29 percent improvement was seen in 70 patients (30.43%).
30 to 39 percent improvement was seen in 27 patients (11.74%).
More than 40 percent improvement was seen in 3 patients (1.30%).

**At the End of Second Week**
Percentage of six minute walk distance improvement in second week was less than 9 percent in 13 (5.65%) patients.
0 to 19 percent improvement in 56 patients (21.54%).
20 to 29 percent improvement was seen in 93 patients (40.43%).
30 to 39 percent improvement in six minute walk distance was observed in 38 patients (16.52%).
More than 40 percent Improvement in 6 Minute Walk Distance was seen in 30 patients(13.04%).

**At the End of Four Weeks of Treatment**
percentage of six minute walk distance improvement at the end of 4th week of treatment are.
Less than 9 percent improvement in 8 Patients (3.47%).
10 to 19 percent improvement was seen in 40 Patients (17.39%).
20 to 29 percent improvement was seen in 107 Patients (46.52%).
30 to 39 percent improvement was seen in 43 patients (18.69%).
More than 40 percent improvement was seen in 32 patients (13.91%).

<table>
<thead>
<tr>
<th>Distance Walked in Mtrs</th>
<th>No. of Patients</th>
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<tbody>
<tr>
<td>50-99</td>
<td>12</td>
</tr>
<tr>
<td>100-199</td>
<td>86</td>
</tr>
<tr>
<td>200-299</td>
<td>74</td>
</tr>
<tr>
<td>300-399</td>
<td>50</td>
</tr>
<tr>
<td>&gt;400</td>
<td>8</td>
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</tbody>
</table>

*Table 2 : Initial Distance walked*
We assessed the patients at time of admission of study after 1st week, 2nd week and 4th week. We calculated the percentage of improvement from base levels at 1st week, 2nd week and 4th week of bronchodilator treatment.

While many of studies interpreted the levels based on improvement in metres of distance walked. We do not consider the absolute distance walked as different patients had difference ability to walk. Six minute walk distance can be compared in the same individual but cannot be compared in two different individuals.

In our study we found that among serial follow up patients, maximum no of patients improved after 2nd and 4th week of bronchodilator therapy.

Our study suggested that six minute walk test, performed at beginning at time of admission of patients and then at 2 weeks and 4th week of therapy can ideally predict the improvement.

There are several modalities available for the objective evaluation of functional exercise capacity. Some provide a very complete assessment of all systems involved in exercise performance (High tech), whereas others provide basic information and are simpler to perform. The most popular clinical exercise tests in order of increasing complexity are stair climbing, a 6MWT, a shuttle-walk test, and a cardiac stress test (e.g., Bruce protocol), and a cardiopulmonary exercise test. Assessment of functional capacity has traditionally been done by merely asking patients the following: “How many flights of stairs can you climb or how many blocks can you walk?” However, patients vary in their recollection and may report overestimations or underestimations of their true functional capacity. Objective measurements are usually better than self-reports. A 12-minute field performance test was then developed to evaluate the level of physical fitness of healthy individuals. The walking test was also adapted to assess disability in patients with chronic bronchitis. In an attempt to accommodate patients with respiratory disease for whom walking 12 minutes was too exhausting, a 6-minute walk was found to perform as well as the 12-minute walk.

A recent review of functional walking tests concluded that “The 6MWT is easy to administer, better tolerated, and more reflective of activities of daily living than the other walk tests.” The 6MWT is a practical simple test that requires a 100-ft hallway but no exercise equipment or advanced training for technicians. Walking is an activity and distance that a patient can quickly walk on a flat, hard surface in a period of 6 minutes (The 6MWD) is calculated. It is self-paced. It evaluates the global and integrated responses of all the systems involved during exercise, including the pulmonary and cardiovascular systems, systemic circulation, peripheral circulation, blood, neuromuscular units, and muscle metabolism. It does not provide specific information on the function of each of the different organs and systems involved in exercise or the mechanism of exercise limitation, as is possible with maximal cardiopulmonary exercise testing.

Solway S et al. presented that Correlations of 6MWT distance and maximal oxygen consumption ranged from 0.51 to 0.90. Patients with increased likelihood of postoperative complications, hospitalization, and death were identified by analysis of distance walked.

<table>
<thead>
<tr>
<th>Percentage of Improvement</th>
<th>1st Week</th>
<th>2nd Week</th>
<th>4th Week</th>
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<tbody>
<tr>
<td>&lt;5%</td>
<td>41</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>10-19%</td>
<td>89</td>
<td>56</td>
<td>40</td>
</tr>
<tr>
<td>20-29%</td>
<td>70</td>
<td>93</td>
<td>107</td>
</tr>
<tr>
<td>30-39%</td>
<td>27</td>
<td>38</td>
<td>43</td>
</tr>
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Table 3: Percentage of Improvement in Distance post Therapy

**DISCUSSION**

Ours is an observational prospective study done in Katuri Medical College, Guntur from January 2014 to June 2015 of Six minute walk test. It is a very useful and simple affordable test to assess respiratory patients even at primary healthcare level. They do not require any costly equipment and the information obtained from this test is enormous and comparable to any complicated investigation. They can be used for assessing patients for Chronic obstructive lung Disease, Bronchial Asthma Pulmonary Hypertension, cardiovascular diseases, interstitial lung diseases, pulmonary fibrosis. The strongest indication for the 6MWT is for measuring the response to medical interventions in patients with moderate to severe heart or lung disease. The 6MWT has also been used as a one-time measure of functional status of patients, as well as a predictor of morbidity and mortality (Formal cardiopulmonary exercise testing provides a global assessment of the exercise response. The 6MWT does not determine peak oxygen uptake or diagnose the cause of dyspnoea. But can be used to measure the functional effort tolerance, desaturation with exercise and for response to treatment. Can be used at the time of diagnosis during the treatment and after treatment.

The information provided by a 6MWT should be considered complementary to cardiopulmonary exercise testing, not a replacement for it. Despite the difference between these two functional tests, some good correlations between them have been reported.

In some clinical situations, the 6MWT provides information that may be a better index of the patient’s ability to perform daily activities than is peak oxygen uptake; for example, 6MWD correlates better with formal measures of quality of life before and after treatment.

In our study of six minute walk test we have taken 250 patients with respiratory symptoms of cough and breathlessness, then we got follow up of 230 patients.
McGavin CR et al used 12 minute walk test and found that there was no correlation between 12 minute walk distance and FEV1 but a significant relation to FVC in COPD patients

Sachin R Agrawal et al found an inverse linear relation between 6MWD and the severity of COPD. There was a strong positive correlation found between 6MWD and FEV1% predicted.

Mosharraf-Hossain, Akim et al study showed that reference values for the 6MWT are variable in Bangladeshi population and lifestyle among COPD patients as measured by physical activity, balanced diet, and caloric intake, is highly related to the severity of the disease and their quality of life.

Anderson Joseph et al utilized 6MWT in their study and found that improvement was seen in the second test and they also demonstrated exercise induced desaturation in their subjects. They described it as a simple reproducible outpatient test in COPD patients. They also utilized this test for Bronchial asthma, cystic fibrosis, Interstitial pulmonary fibrosis and bronchiectasis patients.

Avery MA et al showed that patients who completed 25 shuttles on two occasions will have VO2(max) <10 mL/kg/min. Desaturation during an exercise test has been associated with an increased risk for perioperative complications.

Cahalin L et al in their study concluded that The distance ambulated during a 6MWT can predict VO2 max in patients with end-stage lung disease.

Guyatt GH et al found that the walk test provides a good measure of function in patients with heart and lung disease.

Ilir J. also stressed the importance of 6 minute walk distance and desaturation with exercise in COPD patients.

Pereira LF et al utilized the 6MWT for their patients of asthma and found that UCSA (Uncontrolled severe asthma patients) are similar to normal subjects in terms of 6MWT variables and respiratory muscle strength.

Sumer S Choudhary et al found that it is a safe and practical test of sub maximal functional capacity, which measures the maximum distance walked by a subject in 6 minutes. Advantage of this test is that it provides an acceptable index of functional disability and correlates with oxygen uptake measured during comprehensive testing.

Mitali Bharat Agrawal et al opined that in chronic pulmonary diseases FEV1 & FVC significantly correlated with percent predicted 6MWD, pre and post exercise pO2 and basal pCO2 while only FVC significantly correlated with exercise desaturation. FEV1 & FEV1/FVC correlated significantly with post exercise pCO2 while MVC correlated only with basal pCO2. It was also found that 6MWD also correlated with pre and post exercise pO2. Thus there is significant correlation between 6MWT and spirometry.

Naoko TOJO et al stressed the importance of exercise tests in predicting the outcome in Lung Volume Reduction surgery. Van Gestel AJ concluded that walking capacity mostly depends on the rate of increase of pulmonary blood flow and our results underline the fact that cardiocirculatory function may play a significant role in exercise tolerance in patients with COPD.

The self-paced 6MWT assesses the submaximal level of functional capacity. Most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during the test. However, because most activities of daily living are performed at submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities.

6MW Test can be performed daily by all but the most severely impaired patients. Most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during the test. However, because most activities of daily living are performed at submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities.

SUMMARY Six minute walk test is very useful test even in resource poor setting, even at primary health care level for respiratory patients of bronchial asthma and COPD. It can be done for patients of pulmonary fibrosis, interstitial lung diseases, connective tissue disease, and drug induced lung diseases and radiation induced pulmonary fibrosis. The test can also be done, for evaluation of patients, after chemotherapy and radiotherapy. The test can be performed at the beginning of treatment and after treatment. Useful for Preoperative and post-operative evaluation and evaluation and can predict fitness for surgery.

The test can be compared only in the same individual only but cannot be compared between individuals as each person has different ability to walk.

Maximal response to treatment were seen after 2nd and 4th week so we recommend six minute walk test at beginning of treatment and response to treatment assess only after 2nd and 4th week.

Six minute walk test can be safely extended for patients of pulmonary arterial hypertension congestive heart failure, and valvular heart disease. It is also useful test for prediction of mortality and morbidity.

CONCLUSION Six minute walk test is a simple test that can give information comparable to any sophisticated investigation. It is useful for assessment of the respiratory patients at the beginning of therapy, during and after treatment. The 6 Minute Walk Test should be done routinely in all institutions for assessing patients of breathlessness.

REFERENCES