

Six Minute Walk Test As An Assessment Tool In Systemic Sclerosis

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Citation

L Bichile, T Bichile, A Ehsan, J Kharaje. *Six Minute Walk Test As An Assessment Tool In Systemic Sclerosis*. The Internet Journal of Rheumatology. 2008 Volume 6 Number 1.

Abstract

Systemic sclerosis (SS) is a multisystem disorder with lung fibrosis as a commonly manifestation. Six minute walk test (6MWT) is a practical & simple measurement of functional status that is widely used as a clinical tool & outcome measures in interstitial lung disease (ILD). In our study 25 females (92.59%) and 2(7.41%) males with SS were enrolled. mean disease duration was 3.5yrs. 15 patients (55.55%) with early disease reported within 3 yrs of disease onset .13 patients (48.14%) had disease of more than 3yrs duration. 25 (92.59%) patients complained of dyspnoea and 13(48.14%) had Velcro crepitations. Average O₂ desaturation on 6MWT was – 6.53 % & it improved to + 4.53 % at 6 months post treatment. Dyspnoea scale as assessed initially on Borg's scale revealed 9 (33.33%) patients on scale II, 4 (14.81%) on scale IV, 2(7.4%) patients on scale V, 1 on scale I. Post treatment this changed to 5(18.5%) patients with scale I, 2(7.4%) patients each on scale II & III & nil on scale V, 3(11.11%) patients were shifted to dyspnoea scale < 1 .Post treatment 6 MWT distance and velocity improved in 13(48.14%) patients, remained static in 2(7.4%) patients, decreased in 2(7.4%) patients. There was a significant correlation between 6 MWT & walk distance (P = 0.05) & velocity (P value= 0.01) respectively. Improved dyspnoea perception and oxygen concentration indirectly establishes efficacy of treatment protocol and improved quality of life on pulmonary parameters. 6MWT with oxygen saturation studies is a simple and reproducible test in the work up and follow up of patients of SS with ILD.

INTRODUCTION

Systemic sclerosis (SS) is a chronic multisystemic disorder characterized by skin thickening due to accumulation of excess connective tissue along with structural and functional abnormalities of visceral organs. Lung fibrosis is commonly observed in patients with systemic sclerosis and is characterized by progressive breathlessness on exertion, velcro crepitations and abnormal gas exchange .Six minute walk test (6MWT) is a practical & simple measurement of functional status that is widely used as a clinical tool & outcome measures in ILD We undertook this study in patients with scleroderma having lung involvement in the form of ILD to assess lung morbidity at the baseline and after six months.

AIMS & OBJECTIVES

1. To administer 6 minute walk test (6MWT) in scleroderma patients & compare it with dyspnoea, oxygen desaturation and walk distance at baseline and at 6 months interval.
2. To evaluate 6MWT and correlate with high resolution CT (HRCT) grades, pulmonary function

tests (PFT) and diffusion capacity for carbon monoxide (DLCO).

MATERIAL & METHODS

After obtaining ethics committee permission, this prospective study was conducted in the Rheumatology unit at K.E.M. Hospital, Parel, Mumbai, India.

INCLUSION CRITERIA

1. Patients fulfilling 1980 ACR criteria for SSC.
2. Patients between ages group 18yr to 50 yr.
3. Patients willing to undergo study & follow up.

EXCLUSION CRITERIA

1. Patients with features of overlap syndrome
2. Patients with primary PHT.
3. Patients with valvular heart disease, congenial heart disease.
4. Patients of scleroderma with pulmonary

hypertension.

Patients underwent routine hematological & biochemical tests, immunological tests for antibodies. PFT, DLCO, HRCT were performed to assess ILD. Modified Borg Dyspnoea scale, a validated tool, was administered to grade dyspnoea. 6MWT was administered at the baseline and at 6 months. O₂ saturation at baseline was measured with the help of pulse oxymeter at room air in a non air conditioned room. Patients with oxygen saturation < 88% at baseline were excluded. The test was conducted on an 18.7m long level course marked in an unobstructed area. Oxygen saturation was recorded continuously by pulse oxymeter at rest for 5 min prior to the test, throughout the 6 MWT and immediately after the test. During the 6MWT, patients were instructed to walk at a pace comfortable to them for 6 min until they experience fatigue or dyspnoea and were asked to stop, if saturation dropped to <80%.

STATISTICAL ANALYSIS

The distance covered and O₂ saturation was recorded at the end of the test. The primary parameters of 6MWT were the end exercise change in oxygen saturation from baseline to 6 months and change in dyspnoea. Secondary parameter was walk distance. Relationship between parameters of the 6MWT & PFT, HRCT was assessed with Spearman and Kendall rank correlation coefficients. An intraclass correlation coefficient was used to assess the repeatability of 6MWT parameters.

OBSERVATIONS & RESULTS

A total of 27 patients fulfilling the inclusion criteria were enrolled. There were 25 females (92.59%) and 2(7.41%) males. Their average age was 33yrs and mean disease duration was 3.5yrs. 15 patients (55.55%) with early disease reported within 3 yrs of disease onset. 13 patients (48.14%) had disease of more than 3yrs duration. 25 (92.59%) patients complained of dyspnoea and 13(48.14%) of them had Velcro crepitations. ANA was positive in 25 (92.59%) patients, Anti scl was positive in 10(37.03%) and negative in 12(44.44%). For the purpose of data analysis. Desaturation (Resting O₂ saturation - O₂ saturation after 6 minute walk) was defined as a decrease in O₂ from the baseline. O₂ saturation was measured at baseline and immediately after the 6 MWT and compared with change in O₂ saturation at 6 months following 6 MWT. Initial post 6MWT O₂ desaturation showed improvement on treatment at 6 months in all the patients. Average O₂ saturation on 6MWT was - 6.53 % & it

improved to + 4.53 % at 6 months post treatment.

Figure 1

Table 1: H.R.C.T (ref) Grading and oxygen saturation

Normal	2(7.4%)
Grade I	2(7.4%)
Grade II	9(33.33%)
Grade III	4(14.81%)

Initial O₂ desaturation on 6 MWT was observed in all patients and could not be correlated with the HRCT grades. However on treatment at 6 months HRCT could be correlated with O₂ saturation with P value 0.05. PFT revealed mild to moderate restriction. DLCO was < 40 in all of them. PFT pattern of restriction and decreased DLCO could be well correlated with P value = 0.05 with O₂ saturation at 6 MWT at 6 months. Dyspnoea scale as assessed initially on Borg's scale revealed 9 (33.33%) patients on scale II, 4 (14.81%) on scale IV, 2(7.4%) patients on scale V, 1 on scale I. Post treatment this changed to 5(18.5%) patients with scale I, 2(7.4%) patients each on scale II & III & nil on scale V, 3(11.11%) patients were shifted to dyspnoea scale < 1. Post treatment 6 MWT distance and velocity improved in 13(48.14%) patients, remained static in 2(7.4%) patients, decreased in 2(7.4%) patients. This paralleled with the improved dyspnoea scale and improved O₂ saturation. There was a significant correlation between 6 MWT & walk distance (P = 0.05) & velocity (P value=0.01) respectively.

Figure 2

Table 2: Walk Velocity and walk distance

Distance covered in Mtrs at baseline	Walk Velocity at baseline	Distance covered in Mtrs after 6 mths	Walk Velocity at 6 mths	Remarks
355.3	59.2	355.3	59.2	Static
378.675	63.1	374	62.3	Static
336.6	56.1	355.3	59.2	Increase
486.2	81	490.1	81.6	Static
392.7	65.5	448.8	74.8	Increase
374	62.3	392.7	74.8	Increase
514.25	85.7	411.4	68.5	Decrease
374	62.3	355.3	59.2	Decrease
355.3	59.2	430.1	71.6	Increase
224.4	37.4	374	62.3	Increase
317.9	52.9	392.7	65.5	Increase
411.4	68.5	430.1	71.6	Increase
327.25	53.9	392.7	65.5	Increase
355.3	59.2	392.7	65.5	Increase
355.3	59.2	392.7	65.3	Increase
392.7	65.5	422.62	70.4	Increase
355.3	59.2	448.8	74.8	Increase

Figure 3

Table 3: Change in Dyspnoea Scale at 6 Months

Mod. Borg Index (pre1)	Mod. Borg Index (post-1)	Mod. Borg Index (post 2)
At baseline		At 6 months
0	1	0
0	1	0
0	2	1
0	2	1
0	2	2
0	5	3
0	2	0
0	2	0
0	3	1
0	2	3
0	5	1
0	2	0.5
0	2	0.5
0	3	2
0	3	1
0	2	0.5
0	3	2

Figure 4

Table 4: Observations on O2 Saturation with PFT and DLCO Initial and at 6 months

At Baseline		At 6 Months			
O2 Saturation (pre)	O2 Saturation (post)	O2 Saturation (pre)	O2 Saturation (post)	PFT-Restriction	DLCO
92	88	97	97	Mod. Restriction	Decreased
97	97	97	97	Mild Restriction	Decreased
97	94	98	98	Mild Restriction	Decreased
95	88	97	83	Mod Restriction	Decreased
98	82	99	98	Severe Restriction	Decreased
98	97	97	97	Severe Restriction	Decreased
98	97	98	98	Severe Restriction	Decreased
98	97	97	97	Mod. Restriction	Decreased
93	91	96	64	Severe Restriction	Decreased
99	80	97	98	Mild Restriction	Decreased
97	83	98	97	Mod. Restriction	Decreased
97	94	97	97	Normal Flow Rate	Normal
97	90	97	98	Mild Restriction	Decreased
97	93	98	96	Mild Restriction	Decreased
94	85	99	93	Mild Restriction	Decreased
97	77	97	92	Mod. Restriction	Decreased
95	94	97	96	Mild Restriction	Decreased

DISCUSSION

Lung involvement constitutes the major cause of morbidity & mortality in scleroderma patients. Pulmonary fibrosis indicates interstitial inflammation. One of the alarming symptoms of ILD is progressive dyspnoea and limitation of exercise. Poor prognostic markers in scleroderma being diffuse skin involvement, male sex, black race and visceral organ disease.²³⁴ Pulmonary fibrosis and pulmonary hypertension are the leading causes of disease - related deaths. Scleroderma patients with ILD show significant reduction in exercise capacity and in O₂ uptake. It is proposed that desaturation at the end of walk test would be as informative of severity of lung involvement as the decrease in walk distance. It is also verified that patients with ILD do have normal O₂ saturation at rest. However, during sub maximal exercise some of them will show desaturation. End exercise PaO₂ is an important measure of disease severity in ILD. Decrease in saturation during self paced walking is a meaningful measure of disease status in patients with scleroderma lung disease.

Eaton ⁷ Lama ⁸ have demonstrated that patients with usual interstitial pneumonia who desaturated during a 6 MWT have increased risk of dying at follow up. Desaturation does not occur in normal subjects. In Fibrotic Idiopathic interstitial pneumonia, Eaton et al ⁷ found that the distance walked during 6MWT is reproducible and unlikely to improve with repeated testing. Normal values of walk distance are not available. However our patients covered an average distance 370.97 metres in 6 mts & this improves to 403.48 metres at 6 months on treatment. Another important association with walk distance is the initial dyspnoea scale and its change at 6 months on 6 MWT after treatment. We observed improvement (Table 3) & this indicates the effectiveness of treatment protocol.

We found an association between initial HRCT grading & improved O₂ saturation post 6 MWT on treatment predicting a good outcome in patients with grade II class of ILD. 15 of our patients had disease duration < 3yrs and the most common functional impairment in them was impaired gas exchange on exercise when the demand of O₂ increased. In these patients a simple test to evaluate exercise capacity is the six minute walk test and walk distance. 6MWT and walk distance is used as a primary outcome in clinical trial on ILD. Hb desaturation during 6MWT is predictive of mortality in patients with primary pulmonary hypertension & P.H in SS. None of our patients included in the study had PH. However they had ILD, Majority of our patients had grade 2 ILD. Predominantly parenchymal opacification and less reticular pattern. These patients received multitargeted treatment in the form of steroid 10-15mg / day tapered to 5-2.5 mg at 6 months, calcium channel blocker nifedipine 20mg/d, enalapril 5mg/d, aspirin 150 mg/d & Azathioprin 2mg/ kg/d as an immunosuppressant. Significant improvement was observed in the pulmonary parameter (dyspnoea), O₂ saturation, walk velocity & walk distance on this treatment protocol on walk test. Improved clinical parameters in the form of dyspnoea perception and improved oxygen concentration indirectly establishes efficacy of treatment protocol and improved quality of life on

pulmonary parameters

6MWT with oxygen saturation studies is a simple, reproducible, less time consuming, test in the work up and follow up of patients with ILD in scleroderma. It can be recommended as a test to prognosticate the pulmonary morbidity in scleroderma. Routine application of this test in scleroderma clinic on a large cohort will be rewarding.

CONCLUSION

6MWT is simple, reproducible test to document effort tolerance with respect to contribution from lung.

It is a good parameter to assess the multitargeted therapy.

We recommend 6MWT to be included as one of the assessment parameter in 1st 3yrs of disease.

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