Research Article (Open access)

Effect of Intensive Treadmill Training on Gait and Functional Mobility in Patients with Parkinsonism -A Simple Randomized Control clinical Trail

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ABSTRACT: **Background**: Parkinson's disease (also known as Parkinson disease or PD) is a degenerative disorder of the central nervous system that often impairs the sufferer's motor skills, speech, and other functions. It is characterized by muscle rigidity, tremor, a slowing of physical movement (bradykinesia) and, in extreme cases, a loss of physical movement (akinesia). The patients with PD are typically marked by reduced speed, shortened stride length and longer double support phase. The use of electromechanical devices such as treadmill training has been used in rehabilitation of patients with impaired gait. This study was done to assess the effect of treadmill training over the Gait and functional mobility in Parkinson's patients.

Methods: This study was conducted at S.M.S Hospital, Jaipur, Anisha Multispecialty Hospital Guntur, AP, Physiotherapy center, Punjabi Bagh, New Delhi and some other local referral clinics in Lucknow (2008-2010). The total study period was 2 years. The treatment for each subject was for a period of 8 weeks, 3 sessions a week with 20 minutes as a single session. A total of 20 (n=20) patients who are diagnosed with PD by the Physician were randomly selected after taking consent for their participation in the study. The outcomes were measured by subjective assessment of PDQ-39, and objectively assessed by Gait speed and Stride length.

Results: In this study to evaluate the effectiveness of intensive treadmill training over the gait and functional mobility in Patients with Parkinson's disease, all data were expressed as Mean+/- SD and was statistically analyzed by using Paired 't' test. It was used to examine the changes in the dependent variables from baseline to after completion of the intervention. The pre-test mean value of PDQ-39 was 31.27(SD=4.69) and the post-test mean is 21.25(SD=2.95). The pre-test mean value of Gait speed was 1.03(SD=0.09) and the post-test mean was 1.24(SD=0.09). The pre-test mean value of stride length was 0.99(SD=0.09) and the post test mean is 1.19(SD=0.06) with p value <0.05 in all the parameters. Thus, from the above statistical data of PDQ-39, Gait speed and Stride length, the post test values are significantly different from pre-test values with p<0.05, i.e. 95% level of significance, hence the null hypothesis was rejected.

Conclusion: Intensive treadmill training was effective on Gait and Functional mobility in patients with Parkinson's disease.

Key-Words: Parkinson's disease, Gait, PDQ-39, Stride length, Gait speed.

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INTRODUCTION

Parkinson's disease (also known as Parkinson disease or PD) is a degenerative disorder of the central nervous system that often impairs the sufferer's motor skills, speech, and other functions.

It is a slowly progressing disease involving primarily a degeneration of cells in basal ganglia and substantia nigra leading to deficit of dopamine-a neurotransmitter which produces gradual weakness of the voluntary movement with muscular rigidity, tremors impairment in the balance

and automatic reactions.

It is characterized by muscle rigidity, tremor, a slowing of physical movement (bradykinesia) and, in extreme cases, a loss of physical movement (akinesia).

The term Parkinsonism is used for symptoms of tremor, stiffness, and slowing of movement caused by loss of Prevalence and incidence of PD is the second most common neurodegenerative disorder. The incidence increases dramatically with increasing age. About 1% affected over the age of 65 and more than 4% of the populations are affected by the age of 85 years[1]. Approximately 13-33% of the patients present with postural instability and Gait disturbances as their initial motor symptoms and comprise a postural instability Gait disturbed (PIGD) group. Gait disturbances are also a common feature of late onset or advanced PD[2]. The Patient with PD Demonstrates a number of significant Gait changes resulting from impoverished movement. The various gait disturbances found in PD are

Shuffling gait: Gait is characterized by short steps, with feet barely leaving the ground. Small obstacles tend to cause the patient to trip. There is decreased arm-swing.

Turning "en bloc": rather than the usual twisting of the neck and trunk and pivoting on the toes, PD patients keep their neck and trunk rigid, requiring multiple small steps to accomplish a turn

Festination: Because of a combination of stooped posture, imbalance, and short steps it results to a gait that gets progressively faster and faster, often ending in a fall.

The patients with PD are typically marked by reduced speed, shortened stride length and longer double support phase[3].The mobility problems have a greater negative impact on patient's quality of life and their mental well being[4]. Although modern methods of Medical and surgical care is available, patients develop progressive disability[5]. The use of electromechanical devices such as treadmill training has been used in rehabilitation of patients with impaired gait[6].This study was done to assess the effect of treadmill training over the Gait and functional mobility in Parkinson's patients.

MATERIALS AND METHODS

This study was conducted at S.M.S Hospital, Jaipur, Anisha Multispeciality Hospital, Guntur, A.P, Physiotherapy center, Punjabi Bagh, New Delhi and some other local referral clinics in Lucknow (2008-2010). The total study period was 2 years. The treatment for each subject was for a period of 8 weeks, 3 sessions a week with 20 minutes as a single session.

A total of 20 patients who are diagnosed with PD by the Physician were randomly selected after taking consent for their participation in the study. The inclusion criteria include the patients who are not demented, patients who were able to ambulate, Patients with a Grade I-III on Hoeh & Yahr scale. The patients with poor general condition, patients with compromised cardiovascular responses, age more than 75 years were not included in the study.

dopamine.

Parkinson's disease was first described in England in 1817 by James Parkinson. The condition was popularly known as shaking palsy derived from the Latin word paralysis agitans.

Technique: After taking informed consent from the patients and being satisfied by inclusion criteria, were selected randomly for treatment. The patients were explained about the total treatment protocol.

Initial assessment was taken before the start of the treatment. The patients gait was assessed subjectively by Parkinson's disease Questionnaire (PDQ-39). The objective assessment of the gait was done by Gait speed (m/sec) and Stride length in meters.

The patient was made to walk on motorized treadmill under close supervision of the therapist. The patient was made to wear a safety helmet and harness to prevent falls. The training programme consisted of a 20 minute session for 3 times a week for a total period of 8 weeks. Once a week over ground walking speed was reevaluated and treadmill speed was adjusted accordingly, hence there was a progressive increase in the gait speed. The settings on the initiation of the programme over the treadmill were described in Table 1.

Outcome measures: The outcome of the treatment was assessed pretest and post test by PDQ-39. It is a 39 items questionnaire on the subjective report of the impact of PD on daily life and addresses 8 health related quality of life dimensions (Mobility, ADL, Emotional well being, Stigma, Social support, Cognition, Communication and Bodily discomfort) A summary score (The Parkinson's disease summary index (PDSI) can also be determined by the scores that range from 0 meaning perfect health and 100 meaning worst health. The gait speed was assessed by Measure and mark technique. This included marking a standard distance 5 meters and then the patient is asked to walk with comfortable pace. The patient is made to walk 3 repetitions and the average time is calculated. Then the speed of the gait is calculated by the formula:

Gait Speed =distance/time[7]

The stride length is calculated by the formula:

Stride length =speed /no of steps per second

RESULT

In this study to evaluate the effectiveness of intensive treadmill training over the gait and functional mobility in Patients with Parkinson's disease, all data were expressed as Mean+/- SD and was statistically analyzed by using Paired 't' test. It was used to examine the changes in the dependent variables from baseline to after completion of the intervention.

The pretest mean value of PDQ-39 was 31.27(SD=4.69) and the post test mean was 21.25(SD=2.95) with p value <0.05 which shows there was a significant difference be-

tween pre-test and post test mean value. (Table 2)
The pretest mean value of Gait speed is 1.03(SD=0.09) and the post test mean is 1.24(SD=0.09) with p value <0.05 which shows there was a significant difference between pre-test and post test mean value of gait speed. (Table 2)
The pretest mean value of stride length was 0.99(SD=0.09) and the post test mean was 1.19(SD=0.06) with p value <0.05 which shows there was a significant difference between pre-test and post test mean value (Table 2).

Table 1: Speed Settings for Treadmill training

S. No	Week	Speed
1	First week	70% of the subjects comfortable ambulatory speed
2	Second week	90% of the subjects comfortable ambulatory speed
3	Third week –eight week	Progressive increase in speed over the comfortable ambulatory speed of the patient

Table 2: Pre test and Post values

Measures	Pretest value		Post test value		P value
	Mean	S.D	Mean	S.D	
PDQ 39	31.27	4.69	21.25	2.95	0.011
Gait speed (Meters/Sec)	1.03	0.09	1.24	0.09	0.015
Stride length (meters)	0.99	0.09	1.19	0.06	0.012

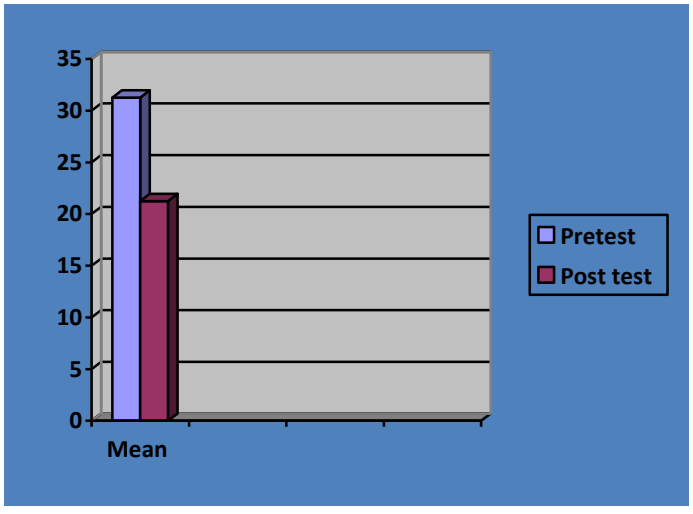

Fig. 1: comparison of Pre test and Post test PDQ 39

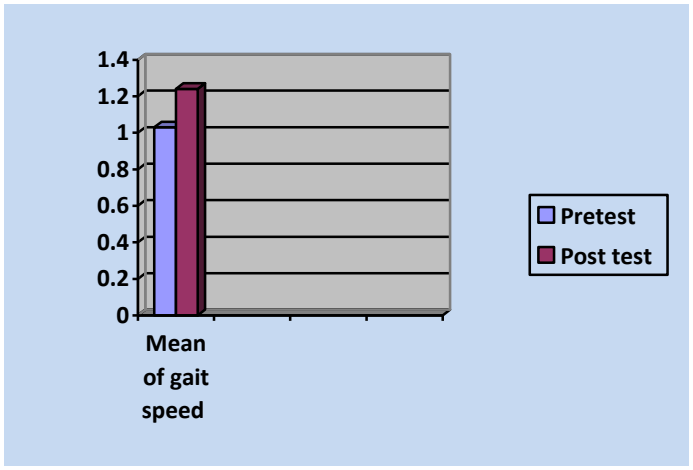

Fig. 2: Comparison of Pretest and Post test Gait speed

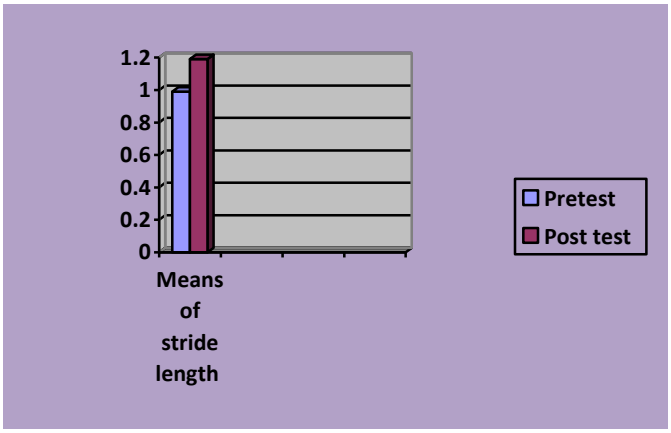

Fig. 3: Comparison of Pretest and post test Stride length

Thus, from the above statistical data of PDQ-39, Gait speed and Stride length, the post test values are significantly different from pretest values with p<0.05, i.e 95% level of significance, hence we reject the null hypothesis.

DISCUSSION

In this study to evaluate the effect of intensive treadmill training over the gait and functional mobility in Patients with Parkinson's disease, there was statistical difference in the pre and post test values, hence thereby we rejected the null hypothesis.
This randomized controlled trail evaluated the efficiency of the treadmill training on the gait and functional mobility of Parkinson's patients.
The participants in the study were the patients with mild to moderate PD, who obtained benefit from a gait training intervention. The ability of a patient to walk after suffering PD is often hindered by rigidity, reduced muscle torque, Loss of available Range of motion, weakness or decreased Muscle power. Treadmill training is beneficial for the patients as it provides an opportunity for extensive practice of the whole task of walking in the presence of muscle weakness and poor balance control.
Treadmill training is the newest innovation to improve gait in patients with various Neurological dysfunction. Miyai *et al*.[8] in his study in 2000 has proved that treadmill walking is more effective than that of conventional PD gait training

programme.

Phol *et al*.[9] in his study in 2003 examined the immediate effects of a single treadmill session in a crossover, 4 consecutive day trail in 17 patients with early PD. Their results suggest that gait speed and stride length can be improved through a single intervention of the treadmill but not through conventional gait training.

Protas *et al*.[10] in their study in 2005 assessed the benefits of gait and step training in PD and found that walking on a treadmill at a greater speed resulted in a reduction in falls and improvement in gait and dynamic balance in a small group of patients.

Fiatarone *et al*.[11] showed that high intensity, progressive resistance training is highly efficacious, even among frail adults.

The mechanism whereby treadmill training works in PD remains to be fully determined. One of the explained possibilities is that the treadmill acts as an external cue by setting the walking patterns, reinforcing neural circuits which are meant for normal gait pacing. The improvement in Gait can also be attributed to the principles of motor learning. VanHedel *et al*.[12] evaluated the acquisition and performance of a high precision locomotor task in patients with PD compared with healthy subjects. He founded that initially PD patients performed poorer and after task repletion, the groups performed similarly, indicating that adequate training can improve locomotor behavior in PD patients.

Thus, the treadmill protocol described here would achieve short term and long term goals in gait performance in patients with PD.

CONCLUSIONS

The following conclusion is drawn from the present study. Intensive treadmill training is effective on Gait and Functional mobility in patients with Parkinson's disease.

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