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Short Communication

Physiotherapy Section

Short Duration, Intensive Bed Mobility Training in Idiopathic Parkinson's Patients- One Group Pre-post Test Study Design

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ABSTRACT

Introduction: Patients with Parkinson's disease have difficulty in moving inside and getting out of the bed. Lack of bed mobility has several impacts on these patients including sleep disturbances. Generally, the length of stay in hospital for these patients is limited to few days which become a challenging task for significant improvement in bed mobility.

Aim: To determine the effectiveness of short duration, intensive bed mobility training in idiopathic Parkinson's disease patients.

Materials and Methods: One group pre post-test study design was used. The study included 15 patients diagnosed with Idiopathic Parkinson's disease in the age group of 50-75 years. All the participants in the study were between stage 1.5 to stage 3 on Modified Hoen and Yahr scale. Modified Hoehn and Yahr scale has 1-5 stages which describe the motor symptoms of the Parkinson's disease. This helps in categorising the advancement of the disease based on its stages and track progression of the disease. This study uses modified version of the same scale. The participants were conveniently assigned in a single group, who satisfied the selection criteria. Pre and Post test scores were taken using bed mobility component of Lindop Parkinson's disease mobility assessment (LPAS), body bradykinesia components and turning in bed of Unified Parkinson's Disease Rating Scale (UPDRS). Patients received intensive bed mobility training of short duration (30 mins/session) three times a day for seven days. Total 21 sessions were given to each patient. Paired t-test was used to compare the results of pre and post training for LPAS and UPDRS which were the outcome measures.

Results: There was significant improvement in performing tasks of bed mobility. Patients were able to perform turning in bed without difficulty. Speed and the quality of movements showed drastic improvement. This was supported by statistically significant difference in LPAS bed mobility component, and a statistically significant improvement in pre and post-test performance for UPDRS-turning in bed and body bradykinesia components.

Conclusion: Smaller duration of exercise sessions was effective in improving bed mobility of the idiopathic Parkinson's patients. Practising tasks multiple times a day helped in improving the performance of these patients. Short duration intensive training is effective in improving bed mobility. Studying the long-term effect of short duration intensive training with larger sample size should be considered for further research.

Keywords: Activities of daily living, Neurological rehabilitation, Outcome assessment, Physical therapy intervention, Treatment effectiveness

INTRODUCTION

Motor control and flexibility are two important challenges which are faced by Parkinson's patients. They suffer from severe mobility issues. Bed mobility is a major mobility task for these patients as the severity of the disease increases. Components of bed mobility are side to side rolling, coming to sitting from supine, bridging, and sitting to supine. Difficulties faced for the activities like turning in bed or changing from supine to sitting position were reported by approximately 66% of patients suffering from Parkinson's disease. Impaired bed mobility has deleterious effect on sleep and is a major cause of sleep disturbances [1]. Leading cause of affected bed mobility is hypokinesia/bradykinesia encountered by Parkinson's patients. This directly roots to nocturnal hypokinesia and affects sleep leading to poor quality of life in these patients. Some other assumptions were difficulty in integrating the bed mobility components in a smooth sequence, performing simultaneous task and decreased axial range of motion [1,2].

In Parkinson's disease, as the disease advances motor symptoms such as bradykinesia, rigidity, tremors, gait disturbances, lack of mobility, chances of fall etc., increase. Physiotherapy exercises help in improving quality of life and reducing the symptoms. Hence as the disease advances intensity of physiotherapy exercises needs to be increased. According to the recent studies, rehabilitation for Parkinson's patients should be a goal based high intensity with shorter duration [3]. Effectiveness of similar multidisciplinary rehabilitation programs could last up to three months. Even smaller frequency of therapy, 2-3 times/week for 4-12 weeks has shown an improvement in mobility [4,5]. Longer durations of studies mainly focus on other components of mobility apart from non-motor functions and bradykinesias. Systematic reviews and research reviews mainly focus on gait, fall and fall prevention and balance training strategies [6-10]. Bed Mobility is important to prevent several complications which may remain silent unless the disease progresses.

Generally, rehabilitation for Parkinson's is carried out in out-patient departments with main focus on balance training and functional retraining. The length of stay of idiopathic Parkinson's patient is less than 10 days which becomes challenging to show significant improvement in bed mobility outcome. According to a review of the existing literature, most of the studies on Parkinson's disease focus on training or physiotherapy treatment for longer durations e.g., several weeks or months. There are very few studies available which focus on short duration training for Parkinson's patients [6,11,12]. According to these studies physical therapy has a great role in improving the quality of life for patients suffering from Parkinson's disease. A systematic review published by Allen NE et al., suggested that short duration, highly supervised interventions mostly improve the adherence of participants to training programs and hence allowing the optimal delivery of the motor training program. As a result of which participation and usefulness of the training is maximum. As the current study has similar nature, adequacy of the exercise program to improve bed mobility can be determined more effectively

[13]. The main focus for this study was on reducing the total duration of interventions along with the important aspects of bed mobility [9].

There are no studies which study bed mobility training exclusively. Although there are studies which discuss about effects of loss of bed mobility in Parkinson's patients. Lack of bed mobility is prevalent in later stage of disease and has several secondary complications like sleep disorders, pressure sores, skin infections, joint stiffness. These could lead to further lack of mobility, difficulty in maintaining personal hygiene, excessive fatigue and sleep disturbances.

This study aims at assessing the efficacy of short duration intensive physical therapy exercise sessions in improving 'bed mobility' for the patients suffering from Idiopathic Parkinson's disease. Difference in the pre and post therapy values for Lindop's Parkinson's assessment scale and UPDRS will determine the effectiveness of the intervention. The novelty of this study is, it focuses on the effect of short duration exercise training on bed mobility in Parkinson's patients which has not a commonly studied before.

MATERIALS AND METHODS

This is a one group pre-post test study design. Study was conducted in PSG (P.S.GOVINDASWAMY NAIDU) Hospital, Coimbatore, Tamil Nadu, India. Study duration was 12 months from October 2009 to September 2010. After taking approval from ethical committee of PSG institute of medical science and research (No: 10/130), informed consent was taken from participants. Participants in study were explained about the purpose of study and treatment procedures.

Total 20 patients suffering from Parkinson's disease were screened and assessed for the study according to inclusion and exclusion criteria outlined in more detail below. Only 15 patients satisfied the criteria and 5 were excluded. Of the 5 patients excluded, one had affected cognition, 3 patients had complaints of joint pains and one was diagnosed with high grade fevers during the study. As a result, these 5 patients were excluded from the study. The study population was determined from previous year's census. It was noticed that the number of patients reported with idiopathic Parkinson patients were less, which is supported by the study by Schrag A et al., published in cross-sectional study published in BMJ in 2000, crude prevalence of idiopathic Parkinson's disease is Parkinson's disease (probable and possible combined) were 128 per 100 000. Hence, convenient sampling was done [14].

Inclusion Criteria

Study included 15 patients diagnosed with idiopathic Parkinson's disease. For the purposes of this study, inclusion criteria were as follows:

- Patients diagnosed with idiopathic Parkinson's disease.
- Patients having a score between 1.5 and 3.0 on the Modified Hoen and Yahr scale [15].
- Physically independent patients from age 50-75 years.

The Modified Hoehn and Yahr Scale have 1-5 stages which describe the motor symptoms of the Parkinson's disease. This helps in categorising the advancement of the disease based on its stages and track progression of the disease. The scores range from 1.0 to 5.0 as described below.

- 1.0-Unilateral involvement only
- 1.5-Unilateral and axial involvement
- 2.0-Bilateral involvement without impairment of balance
- 2.5-Mild bilateral disease with recovery on pull test
- 3.0-Mild to moderate bilateral disease; some postural instability; physically independent
- 4.0-Severe disability; still able to walk or stand unassisted
- 5.0-Wheelchair bound or bedridden unless aided

Exclusion Criteria

The exclusion criteria for the purposes of this study were as follows:

1. Patients suffering from associated severe cognitive impairment
2. Patients suffering from an existing severe orthopaedic condition
3. Patients suffering from an existing and associated neuromuscular conditions
4. Patients with affected ability and mobility

Lindop Parkinson's Assessment Scale (LPAS) is a scale used to evaluate and measure gait and bed mobility in Parkinson's patients [16]. The assessment involves recording time taken or steps required by the patient to perform specific mobility tasks. Accessories required to perform the assessment include a bed and chair. The tasks are divided into 2 major categories-Gait Assessment (6 tasks) and Bed Mobility (4 tasks). Total score for bed mobility component is 12. Sub-Components in bed mobility include sit to lie (4 points), turn to left (4 points), turn to right (4 points), lie to sit (4 points).

Each task is assigned a score based on a scale of 0-3 with 3 being the maximum (unaided with ease and less than 5 seconds) and minimum score is 0. Scoring for each subtask in bed mobility component are scored as Unaided with ease (≤ 5 sec)-Score 3, Unaided with effort (6+ sec)-Score 2, Help of 1-Score 1, Help of 2/unable -Score 0.

The individual scores for each of the 10 tasks are then added to get to a cumulative score (ranging between 0 and 30) with 30 being the highest. Total for gait assessment with 6 subtasks is 18. In this study, only the bed mobility component of LPAS was used. There are four components in the Bed Mobility component-turn to right, turn to left, lying to sit and sit to lying.

The amount of support used during movement was measured using Unified Parkinson's Disease Rating Scale (UPDRS)-tuning on side in bed component of motor aspects of experiences of daily living and Body Bradykinesia (Global Spontaneity of Movement) component of motor examination in UPDRS [17]. Score varies from 0 to 4 with turning in Bed/Adjusting Bed Clothes 0-normal, 1-somewhat slow no help needed, 2-can turn alone or adjust sheets but with great difficulty, 3-can initiate but not turn or adjust alone, 4-helpless for getting up from the bed component was assessed and scores vary from 0 to 4 as described. Short duration intensive sessions of components of bed mobility were given to the patients with the frequency of 3 sessions per day for 7 days for one week as per protocol. Each session lasts for 30 minutes. Total of 21 sessions were given.

Interventions

Therapy focused on following steps

1. Visualisation of the movement: Verbal instructions and visual demonstration of the task along with smaller components of sub tasks of the movement were given before starting. Each step was demonstrated and performed in front of patient with verbal cueing. Followed by this mental rehearsal of the whole task by memorising the smaller components (sub tasks) in the correct sequence were done by the patient. Patients performed memorization of movement by practising the whole task in the above mentioned manner.
2. In a component of bed mobility, each segment was practiced separately and performed with the segments along the movement. For example, Rolling to left side: visualising bending of knees and taking arm to the side and rolling to the side followed by practising only bending the knees and taking the arm to side separately and practising the whole component involving all segments.
3. Bed mobility components like rolling to side and rolling back to supine, supine to sit and sit to supine were practised in sequence (every component 15 times with a 60 seconds break after every 5 repetitions).
4. Auditory feedback and cues were given during and at the end of movement.

STATISTICAL ANALYSIS

Data was analysed using SPSS 18.0 and Microsoft Excel. Paired t-test was used to compare results from LPAS and UPDRS components pre and post training. Means were compared for both. Paired t-test was used to compare the change in the scores between pre-test and post-test after short duration intensive training to the patients.

RESULTS

[Table/Fig-1] demonstrates the baseline characteristics of the patients and their demographic data. All the participants included in the study were between 50 to 75 years of age. Out of 15 participants, 10 were males and 5 were females.

Characteristics	Number of Patients
Age (in years)	50-60: 7
	60-70: 6
	70-75: 2
Sex	Male: 10
	Female: 5
Modified Hoehn and Yahr stages	Stage 1.5: 0
	Stage 2.0: 5
	Stage 2.5: 4
	Stage 3.0: 6

[Table/Fig-1]: Baseline characteristics of patients (n=15).

Bed Mobility of Lindop's Parkinson Scale

Significant improvement is seen in the overall performance of all the participants post therapy sessions. There was remarkable change seen clinically when they performed bed mobility tasks post training. Significant clinical improvement was accompanied by difference in pre and post values of LPAS and UPDRS components.

[Table/Fig-2] shows mean and p-value and standard deviation for Lindop's Parkinson's Assessment scale. The calculated t-value using paired t-test was 10.75, (p<0.001) indicating the change in performance was clinically as well as statistically significant showing effectiveness of training.

	Mean score	Mean difference	Standard deviation	t-value	p-value
Pre test	6.25				
Post test	8.25	2	0.669	10.75	p<0.001

[Table/Fig-2]: Mean, Mean difference, standard deviation and paired T-test values of bed mobility of lindop's parkinson's assessment scale.

Bed Turning Component of MDS-UDPRS Scale

[Table/Fig-3] shows the improvement seen in 'bed turning' component in Part 2 of the UDPRS-Motor aspects of experiences in daily living (M-EDL). Here a value of 0 indicates no problems in bed turning while a value of 4 indicates an inability to turn without external assistance. The calculated t-value using paired t-test was 3.313 (p<0.01) indicating a statistically significant level of change due to training.

	Mean score	Mean difference	Standard deviation	t-value	p-value
Pre test	1.5				
Post test	1	0.5	0.5222	3.3134	p<0.001

[Table/Fig-3]: Mean, Mean difference, standard deviation and paired t-test values of turning in bed score of MDS-UPDRS (the unified parkinson's disease rating scale).

Global Spontaneity of Movement (Body Bradykinesia) Component MDS-UPDRS

[Table/Fig-4] shows the improvement seen in 'Global Spontaneity of Movement' component in Part 3 of the MDS-UDPRS-Motor Evaluation [18]. Here a value of 0 indicates no problems in bed turning while a value of 4 indicates severe global slowness and a poverty of spontaneous movements. The calculated t-value using paired t-test was 4.7084 (p<0.001).

	Mean score	Mean difference	Standard deviation	t-value	p-value
Pre Test	2.25				
Post Test	1.58	0.67	0.4923	4.7084	p<0.001

[Table/Fig-4]: Mean, mean difference, standard deviation and paired t-test values of global spontaneity of movement (body bradykinesia) score of MDS-UPDRS.

DISCUSSION

This study was intended to see the effectiveness of exercises in patients suffering from idiopathic Parkinson's disease. In Parkinson's disease, motor symptoms increases as the disease advances. Dyskinesia and rigidity dysautonomia cause further reduction in overall mobility of the patients. Depression, sleeplessness, hallucinations, dementia etc., are the associated complications. Impaired balance and falls are other common causes for poor quality of daily living. All participants received short duration sessions three times per day. Bed mobility components from LPAS and UPDRS were used as outcome measures. Pre therapy and post therapy assessment were carried out for all the participants.

Data analysis for pre and post short duration, intensive therapy showed clinically and statistically significant improvement in performance in all subjects. This could be attributed to the fact that the therapy program included several tasks out of which visual demonstration followed by memorising the sequence of the movement was the first one. Practising and memorising task helped them while performing task due to atomization of the movement.

The automization of movement is possible with constant practice, which is analogous to the study done by Wu T and Hallett M, on automatic movements in Parkinson's patients [7]. Their MRI study suggests that basal ganglia are involved in both motor execution and motor learning. Hence the automization of movements is achievable in Parkinson's patients with a regime of systematic training and sequential practice of a task. However, as compared to normal individuals, the efforts required by Parkinson's patients are greater.

Hackney ME and Earhart GM, concluded in their study that an intensive tango dancing lessons given for short duration showed an improvement in functional mobility in Parkinson's patients with mild-moderately severe stage of disease [9] which is in line with current study. Intensive training for short duration to improve bed mobility along with mental rehearsal and memorising the movement lead to an improvement in functional mobility.

In the study conducted by Ellis T et al., focusing on the effectiveness of inpatient multidisciplinary rehabilitation program in Parkinson's patients, a total of 68 patients received speech therapy, physical therapy and occupational therapy for a total of 5-7 days per week, 3-5 hours per day. It was concluded that Parkinson's patients were benefited by intervention [11]. In current study, patients received one and half hours of therapy per day (30 minutes per session and 3 sessions per day for a week) which showed significant improvement. Despite of spending lesser duration in therapy, patients showed improvement may be due to adding visualisation method along with regular practice. This may have happened due to activation of same pathways for the intense repetition of the movement, and constant training must have helped in achieving atomization of movement reducing the freezing and bradykinesia of the patients.

Schenkman M et al., published a study on randomised controlled trial finding effectiveness of exercises on spinal flexibility and axial movements in Parkinson's disease patients, in early and mid-stage. Ten weeks of exercise program was given to 51 patients. Results showed improvement in axial mobility and physical performance [3]. This study also demonstrated that practising sequential movements activates brain during training and later

when automization takes over.

In achieving a skill, two factors determining the outcome are the duration for which training is given and number of repetitions. In present study, exercise given for short duration but intensively for seven days showed significant improvement in outcome measures. Auditory cues were given to the patients while performing task training of bed mobility components. Auditory cueing and visual cueing are most effective methods used in neurological rehabilitation. Cueing is said to be effective in improving motor control. Auditory and visual cueing has been proven to be effective in reducing freezing of gait and improving gait in Parkinson's patients [5,19-21].

According to the latest study published by Lirani-Silva E et al., auditory cueing is said to be beneficial as the disease progresses. In their study, cueing was more effective for patients with advanced stage of disease [20]. Current study included most of the patients in stage 2 and above rated on Hoen and Yahr scale and hence it can be concluded that patients were benefitted by auditory and visual cueing given during training. The potential cause of improved bed mobility in current study could be integration of components of movement in a smooth sequence and simultaneous execution of the tasks. Visualisation along with intensive therapy may help patients in accomplishing the task with ease and less movement time.

LIMITATION

There are few limitations for this study and could be considered as further scope of the study. A similar study could be conducted in larger sample size, long term effects of interventions and conducting a randomised control trail. This is one group study, control or comparison group can be considered in for further research. As in the current study, sample size is small, 15, as diagnosis and prevalence of idiopathic Parkinson's disease is a challenge. Also, according to the decided inclusion criteria, few patients had to be excluded from the study due to other associated problems. Chronicity of the disease was not taken into the consideration, all the patients included were clinically between stage 1.5 to 3 on Modified Hoen and Yahr scale but the duration of illness from the time of diagnosis was not considered.

CONCLUSION

Patients suffering from idiopathic Parkinson's disease are benefited by the intensive bed mobility training. Shorter duration but intensive exercises helped in improving scores for bed mobility component for UPDRS and LPAS. Multiple sessions in a day with shorter time duration can be administered for quick improvements in Parkinson's patients.

There was clinical as well as statistical improvement seen post intervention but the carry-over/long term effect was not assessed, which will be a hurdle in deciding effective dosage for the long-term improvement in bed mobility.

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