

Case Study

Effect Of Chair Based Tele-Rehabilitation Exercises On Activities Of Daily Living And Motor Components Using Unified Parkinson's Disease Rating Scale In Parkinson's Disease: A Case Study

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ABSTRACT

Background-Covid-19 pandemic has posed a great challenge for people with neurological disorders like Parkinson's-disease to commute to treatment center due to risk of infection, unavailability of transport and most importantly to avail contact treatment commonly practiced in physiotherapy management of neurological patients. With the view of providing home-bound physiotherapy treatment for these patients, we speculated that safe balance intervention under expert supervision may prove beneficial improving their overall function. Thus, study was conducted in sitting using chair based Tele-rehabilitation.

Aim: To study effect of chair-based Tele-rehabilitation on motor and functional components of unified Parkinson's disease rating scale (UPDRS) in Parkinson's patient. **Objectives:** To study effect of intervention on activities-of-daily-living and motor components.

Methodology: A 70-year-old female patient complained of resting tremors in right hand and presented with difficulty in walking, imbalance and frequent episodes of fall. After multiple investigations including CT-brain, she has diagnosed with grade 3(Hoehn &Yahr scale) Parkinson's disease. With medical management, the patient received 30-45 minutes/day, 3 days a week, 12-weeks chair-based exercises using zoom as Tele-medium focusing on stretching, flexibility, strengthening and postural-stability exercises. Baseline offline assessment on (UPDRS)outcome measure was done in September-2021 and post training assessment was done after 12 weeks on 30thDecember-2021.

Results: Motor and Functional improvement was noted on UPDRS scale which included hand mobility, tremors, coordination, improvement in balance and gait(walking)pattern and patient could perform all functional activities such as dressing, sit-to-stand, log-rolling independently and reported no fall-episodes.

Conclusion: Present study concludes that chair-based exercises using tele-rehabilitation provides a safe and highly beneficial alternative mode of rehabilitation especially for patients with Parkinson's who have difficulty in commuting to treatment center and can be effectively prescribed to Parkinson's patients to prevent frequent episodes of fall and to gain functional independence.

KEY WORDS: Chair-based exercises, Tele-rehabilitation, Parkinson's disease.

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INTRODUCTION

Parkinson's disease (PD) is a chronic, progressive neurodegenerative disease with motor and non-motor features. According to a survey by World Health Organization in 2020, there are an estimated 9.4 million diagnosed cases of Parkinson's disease worldwide, and of those an estimated 0.58 million cases in India [1]. The disease features impairment of resting muscle tone and voluntary movement that is caused due to loss of striatal dopamine in the nigrostriatal dopamine pathway. The clinical signs of the disease include bradykinesia, rhythmic tremor, rigidity and postural instability that is followed by dopamine depletion [2]. Research has extensively studied factors of Parkinson's disease like physical presentation, Mental Health, and the effects of social support individually, but only few focus on the comprehensive impacts and obstacles of life with this disease [3].

Exercise training has shown that it improves physiological responses in the body. Up to one-third of age-related decline in aerobic capacity can be reversed with prolonged (more than six months) aerobic training [4].

Chair-based exercises have been shown to have a beneficial effect on maintaining or promoting independence and mobility in older people. Compliance to chair-based programs is generally better than that of standing or dynamic exercise. It is better than standing, because it stabilizes lower spine, minimizes load bearing and reduces balance problems. It minimizes load-bearing and reduces balance problems in those with particularly poor mobility and arthritic pain. It increases confidence in those unable to perform free-standing exercise. The inclusion of such chair seated aerobic programs can overcome the problems associated with risk of fall especially in people with Parkinson's [5].

In this study, patient reported few episodes of fall, lack of confidence and imbalance. Therefore, chair-based exercises are considered as a best suitable treatment option in this current case study.

Telerehabilitation have been also shown as

one of the promising treatment tools in various Neurological conditions [6].

Therefore, ZOOM is considered as tele rehabilitation medium for this patient as she fits all the criteria for tele rehabilitation including good cognition, easy access to internet facility, good family support and presence of technically educated caregiver.

CASE REPORT

A 70 years old female with complaints of imbalance, resting tremors and slowness in gait, telephonically contacted our TMV's Lokmanya Tilak College of Physiotherapy Institutional outpatient department during covid 19 pandemic. Patient faced challenges to visit the treatment centre due to fear of fall, a common presentation in old age. Thereby, she requested for home evaluation by expert physiotherapist. Following this, detailed history was elicited and thorough physical examination undertaken at patients' residence by physiotherapist on 30th September 2021.

Patient is right-handed dominant, home maker by occupation, she resides on 3rd floor with her husband. Building is equipped with lift facility. Mild home modifications such as mounted hand railing in washrooms, addition of foot lamps in home corridor and bed side hand rest were done.

Patient was alright 7 years back until 2016 when she experienced postural imbalance and sustained an episode of fall. She visited her family doctor for the same and was referred to a neurologist and diagnosed with early-stage idiopathic Parkinson's Disease. She is also known case of hyperthyroidism and diabetes mellitus for 7 past years. Patient reported that her symptoms got aggravated from past 1 year and currently experiencing resting tremors more in right hand>left hand, fear of fall while walking, slowness in walking and slowness in speech and anxiety. Patient is currently on medication named Rasalect 0.5mg (monoamine oxide), Pramipex 0.5mg (dopamine agonist), Amantrel 0.5mg.

Motor examination revealed reduced precision and muscle power of hand on pinch dynamometer (right>left), all deep tendon reflexes



Fig. 2: Upper Limb strengthening Exercises in sitting positing.

(biceps, triceps, brachioradialis, quadriceps and tendo Achilles) were intact. There were increased tone in all 4 limbs (lead pipe rigidity on tone examination). Sensory functions (peripheral and higher cortical) were normal. Co-ordination tests, including equilibrium and non-equilibrium were negative which can be accounted for normal functioning of the cerebellum. Depressed shoulder, depressed left ASIS, bowing at knee changes observed in A-P postural view and forward head, increased thoracic kyphosis and lumbar lordosis observed in lateral view. The subject demonstrated an independent gait and the walking pattern showed mild features of festination. The walking speed was 64.5 mts/min, with cadence of 140/min, stride length of 130cms and step length 63cms. Reciprocal arm swing while walking was reduced. She walked with higher weight bearing on left lower limb. FIM score of all ADL were 7 except dressing lower limb which were grade 6. Based on the assessment the subject can be classified as stage 3 Parkinsonism in Hoehn and Yahr scale (Christopher G. Goetz et.al 2004). Currently she is independent in all her activities except draping saree for which she requires minimal assistance.

MATERIALS AND METHODS

A single case study of a 70 years old Parkinson's patient was considered. Approval from the Institute research board was obtained and the subject gave written online consent to participate in the trial. Chair based exercises were delivered using ZOOM as a tele medium. The baseline assessment was done in September 2021 and the post training assessment was done after 12 weeks on 30th December 2021. Unified Parkinson's Disease Rating Scale (UPDRS) outcome measure was used to assess the progress of patient's motor performance and activities of daily living.

Outcome measures: Activities of daily living and motor components are two subcomponents of Unified Parkinson's Disease Rating Scale were considered.

Unified Parkinson Disease Rating Scale, is a rating tool used to measure the course of Parkinson's disease in patients. The UPDRS scale assess subjects on five following segments: 1) Mentation, Behaviour, and Mood, 2) ADL, 3) Motor sections, 4) Modified Hoehn and Yahr Scale, and 5) Schwab and England ADL scale. Some sections of the UPDRS scale

Treatment plan	Protocol	Chair based patient's position	Intensity	Importance
Warming Up	1. Toe Taps 2. Leg Marches 3. Rowing 4. Chair Marching	Sitting in chair	Each for 20-30 seconds.	This involves movements that will help to promote circulation and warm your muscles and joints.
Stretching	1. Trapezius stretches 2. Pectoral Stretch 3. Triceps Stretch 4. Trunk side Stretch 5. Hamstring Stretch 6. Calf Stretch	Sitting in chair	Stretch each muscle for hold for 20 counts, repeat 5 times	This will help to increase your flexibility; it can also help to improve posture and balance.
Mobility	1. Shoulder Mobility 2. Elbow and forearm mobility. 3. Fingers mobility 4. Leg Mobility 5. Ankle Mobility 6. Trunk side flexion and rotation.	Sitting in chair	Each for 10 times	These are exercises that involve gentle movements to loosen and lubricate the joints. This will help to improve flexibility.
Strengthening	1. Shoulder strengthening 2. Elbow and forearm muscle strengthening 3. Grip strengthening 4. Upper Back Strengthening 5. Chest Strengthening 6. Hip and knee muscle Strengthening 7. Intrinsic muscle strengthening	Sitting in chair	First starts with 1 litre bottle and then progressed with low resistant TheraBand. Hold for 5 counts, repeat 10 times.	These exercises will help to strengthen muscles and bones. They are designed to make everyday tasks easier and will help to improve confidence and reduce the risk of injury.
Balance	1. Sit and Stand. 2. Heel Raises. 3. Side Leg Raises. 4. Knee Bends-squatting. 5. Supported lunges. 6. Heel Toe Standing (tandom). 7. Standing On One Leg.	Standing with chair support	repeat 10 times	Helps to improve balance.
Cool down	1. Breathing exercises. 2. Relaxation exercises 3. Facial exercises.	Sitting in chair	Diaphragmatic and pursed lip exercises, Jacobson exercises Omkar chanting	Enhances relaxation.

(Warm up, Stretching, mobility Strengthening, balance and cool down).

require multiple grades assigned to each extremity with a possible maximum of 199 points. A score of 199 on the UPDRS scale represents the worst (total disability) with a score of zero representing (no disability).

Treatment Protocol: Treatment started with orientation of zoom platform and before every session Zoom link were shared using official OPD email id. List of home equipment's required for every session were sent to patient one day prior to each session. wooden chair without hand rest were selected for administering online zoom sessions. The sequence of exercises was kept constant for all treatment sessions. Training was given for 30-45 minutes/day, 3 days a week for a period of 12 weeks. Chair based exercises were

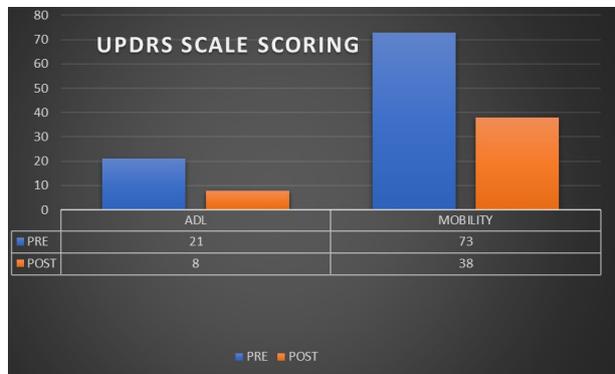
divided into five main sections. Following protocol were followed in every tele rehabilitation session.

RESULTS

The following changes were observed in the UPDRS scale;

- Motor and Functional improvement was noted on UPDRS scale.
- At baseline, ADL score on UPDRS was 21 which showed moderate dependency, and at the end of the trial the scored reduced to 8 which showed minimal dependency in ADL.
- Patient showed significant improvement in handwriting, cutting food and handling utensils, dressing, sit-to-stand, log-rolling.

- Pre Trial-Motor examination score was 73 out of 108 showed maximum motor dependency. post-trial, score declined to 38/108.
- Improvement observed in hand mobility, tremors, co-ordination, static and dynamic balance and gait(walking) pattern.



Graph 1: ADL and Mobility components scoring on UPDRS.

DISCUSSION

The aim of the study was to see the effect of chair based Tele- rehabilitation on motor and functional components of UPDRS in Parkinson's patient. This study showed significant improvement in ADL scores on UPDRS with a pre score of 21 having moderate dependency to post score reduced to 8 which showed minimal dependency. Multiple researches have shown results of chair-based exercises can help to strengthen muscles and bone. Stronger muscles make everyday activities such as washing, dressing, shopping and other household work easier and less strenuous [7].

Our findings extend observations by Mark A. Hirsch et.al, who reported similar improvement in muscle strength and balance in persons with idiopathic Parkinson's disease by high intensity chair-based resistance and balance training [8]. Also, some studies highlighted that an exercise program aimed at improving range of motion combined with activity related exercises improves ADL functioning. Although these studies did not assess the mechanism responsible for increased muscle strength, gains in muscle strength in the participants can be due to improved neural activation, a generalized effect of resistive training or to changes in the intrinsic contractile characteristics of muscle [9].

Chair based exercises provides postural stability and therefore patient can focus on exercises and perform with more ease.

The results our study significantly showed marked decline in the motor scores on UPDRS, with improvement observed in hand mobility, tremors, co-ordination, static and dynamic balance and walking pattern. These results provide an evidence that, chair based exercises helps to stimulate and facilitate the peripheral proprioceptors that have beneficial effects on improving balance and gait in patients with PD [10]. Research studies show that high intensity (velocity/repetition) is a characteristic of exercise that may be important in promoting activity-dependent neuroplasticity of the injured brain, including the basal ganglia. Also, the selective improvement in certain factors constituting the UPDRS suggests that bradykinesia and rigidity benefit preferentially from rehabilitation [11].

The introduction of new technologies has allowed the development of new approaches to treatment such as remote rehabilitation or telerehabilitation. It is based on principles on motor learning as Tele rehabilitation provides visual and auditory feedback, focused more on repetition and practice [12]. Thus, this training has benefitted the Parkinson's patient by increasing the motor and functional performance. Also, it reduced dependency in ADLs in this patient.

CONCLUSION

Present study concludes that chair-based exercises using tele-rehabilitation provides a safe and highly beneficial alternative mode of rehabilitation especially for patients with Parkinson's who have difficulty in commuting to treatment center and can be effectively prescribed to Parkinson's patients to prevent frequent episodes of fall and to gain functional independence.

ABBREVIATIONS

UPDRS: Unified Parkinson's Disease Rating Scale.

ASIS: Anterior superior iliac spine.

FIM: Functional independence measure.

ADL or ADL'S: Activities of daily living.

Authors' contributions: All the authors have made substantial contributions to conception, design, conducting online sessions, acquisition of data, analysis and interpretation of data. All the authors are involved in drafting the manuscript and revising it critically for important intellectual content. All the authors have given final approval of the version to be published.

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