Parkinson’s disease is second most common neurodegenerative disease. The onset is insidious with slow rate of progression. About 5 million people are affected worldwide. The mean age of onset is between 58 and 62 years. Prevalence rises from 1% with those with 60 years age to 4% in population over 80 years. Males are slightly more at risk than females.

Parkinson’s disease or Paralysis agitans was first described as “the shaking palsy” by James Parkinson in 1817. It is chronic, progressive degenerative disorder of nervous system characterised by cardinal features of rigidity, akinesia, bradykinesia, tremors and postural instability. In addition, the disease may cause variety of indirect impairments like movement and gait disturbances, masked face, cognitive and perceptual disturbance, communication and swallowing dysfunction. It is mainly associated with degeneration of dopaminergic neurons in the substantia niagra of mid brain.

Etiology

Most of the movement related symptoms of Parkinson’s disease are caused by lack of dopamine due to loss of dopaminergic cells in substantia niagra. When the amount of dopamine is too low, communication between substantia niagra and corpus straitum becomes ineffective. Thus, movement becomes impaired.

Genetic and pathological studies have revealed that various dysfunctional cellular processes, inflammation, stress and other associated conditions like Shy Drager syndrome, Creutzfeldt-Jakob disease, Encephalitis, Wilson’s disease etc can contribute to cell damage.

In addition, Lewy bodies which contain protein alpha-synuclein are found in brain cells of individuals with Parkinson’s disease.

Clinical Manifestations

A. Motor Symptoms

- **Rigidity**: It is measured by the amount of resistance imposed by a limb when passively mobilised. It affects proximal muscle first and facial muscles. Prolonged rigidity results in decreased ROM and secondary complications of contracture and postural deformity.
- **Tremors**: Resting tremors (pill rolling tremor) is the initial symptom characterized by an involuntary oscillation at a slow frequency of about 4 to 7 cycles per second.
- **Bradykinesia**: It refers to slowness and difficulty in maintaining movement. It is the most disabling symptom leading to increased dependence in daily task.
- **Postural instability**: Patient experiences difficulty during dynamic stabilizing activities like functional reach, walking and turning. Patient performs poorly under condition of perturbed balance. About 1/3 of patient experience fall and 13% falls more than once a week.

B. Neuropsychiatric symptoms

- **Bradyphrenia**: characterised by slowing of thought processes with lack of concentration and attention.
- **Dysthymic Disorder**: characterised by variability in dysphonic mood or a typical depression with intermittent episodes of severe anxiety.
- **Depression**: occurs in 25-40% of patients. They may produce symptoms of apathy, passivity, loss of enthusiasm, change in appetite and dependency.
- **Executive dysfunction**: include problems like planning, cognitive flexibility, abstract
thinking, rule acquisition, initiating and inhibiting actions and selecting relevant sensory information.

- **Perceptual deficits**: includes deficits in vertical perception, topographic orientation, spatial relation, delayed double task and constructional ability.\(^{10,11}\)

C. Other symptoms

It includes fatigue, masked face, swallowing and communication dysfunction, postural stress syndrome, autonomic dysfunction (excessive perspiration, greasy skin, bladder dysfunction and impotence) and cardio pulmonary dysfunction.

Goals and Outcomes of Physical Therapy

- To increase ability to perform self care and home management.
- To enhance behaviour that foster health habits, wellness and improved quality of life.
- To increase strength, power, endurance and aerobic capacity.
- To improve postural control, motor function, balance and gait.
- To enhance decision making regarding use of community resources.
- To decrease level of stress and enhance psychological adjustment of patient and family.

Interventions

Physical Therapy

1. Relaxation Exercises

- Gentle rocking and rotational exercise with the help of vestibular ball, rocking chair and cradle can be used to produce generalised relaxation in rigid group of muscles.
- PNF Technique of Rhythmic Initiation, in which passive to active assisted to lightly resisted movements are designed to overcome the crippling effect of immobility.\(^8\)
- Deep breathing exercise can be incorporated into rotational exercise to enhance relaxation.\(^{12}\) For e.g. Bilateral symmetrical D2 Flexion pattern can be combined with inspiration while expiration is combined with D2 extension pattern.
- Jacobson’s progressive relaxation techniques.\(^{13}\)
- Meditation or cognitive imaging techniques.\(^{14}\)

2. Flexibility Exercises

(a) Stretchings

- Gentle stretching of elbow flexors, hip and knee flexors, ankle plantar flexors can be combined with joint mobilization technique to reduce tightness of joint capsule and ligaments.
- Aggressive and Ballistic stretches should be avoided because they are linked to increased injury as they stimulate pain receptors and cause rebound muscle contracture.

(b) Passive Positioning

- Passive positioning for long duration used to stretch light muscles and soft tissues.
- For “phantom pillow” posture, patient should be positioned in prone.
- For lateral curvature, side lying with small pillow under the truck is advised.
- Bed ridden patients may benefit from traction with low load weights to reduce hip and knee contracture and use of tilt table is also incorporated.\(^{15}\)

(c) PNF Patterns

- This focuses on strengthening the patient’s weak, elongated extensors muscles while ranging the shortened, tight flexor muscles.
- In upper extremities, bilateral symmetrical D2 flexion patterns are ideal to counteract kyphosis while for lower extremities D1 extension pattern to counteract the typical flexed, adducted position.
- Contract Relax technique is preferred because it combine autogenic inhibition from isometric contraction of tight against muscle with active rotations of the limb.\(^8\)

3. Mobility exercises

Exercise program based on functional movement patterns that engage several body segments at once is designed for these patients.

- Prone on elbows and prone extension activities to improve thoracic and neck
extension.
• Standing wall push ups to promote upper trunk extension.
• Pelvic mobility (anterior and posterior tilts, side to side tilts, pelvic clock exercises) and swiss ball exercises to facilitate sitting control.
• Bilateral symmetrical upper extremity D2 flexion and extension, cross one leg over other or scooting to enhance static dynamic control.
• Use of rocking chair to facilitate independent sit to stand transfer.
• Lip pursing, tongue movements, swallowing, smiling and frowning to improve facial expressions.

4. Gait Training
Specific goals are to lengthen stride, broaden BOS, improve stepping, heel toe pattern and increase contralateral trunk movement and arm swing.16
• Marching, stepping forward and backward, side stepping, crossed- step walking, PNF activity of braiding.
• Shuffling gait remedied by using small blocks of about 2 to 3 inches to provide target for the patient to step over.

5. Balance training
• Weight shifts in both sitting and standing. This can be progressed later by adding upper extremities tasks. (e.g Reaching, picking objects off the floor, tying shoes etc.)
• Movement transitions such as sit to stand, half kneeling to standing and stepping can be used to challenge postural control system.
• Sitting activities on gymnastic ball.
• Externally induced perturbation for promoting automatic balance reactions.
• “Kitchen Sink exercise”- standing heel raises and toes off, partial wall squats, single limb stance with side kicks or back kicks.17

6. Respiratory exercises
• Diaphragmatic, segmental and deep breathing exercises to improve chest mobility and vital capacity.
• Air shifts techniques to improve basal expansion.
• PNF Techniques- Bilateral symmetrical D2 flexion and extension of upper extremity along with inspiration and expiration.
• Incentive spirometry and blowing balloon gives visual feedback in improving thoracic expansion.

7. Aerobic Exercises
Submaximal intensity exercises like upper & lower extremity ergometry, static cycling, walking with short bouts swimming are indicated to improve cardiovascular & metabolic responses. Careful monitoring and selection of exercise according to patient’s ability is required.

Psychotherapy
Psychotherapy, the talking cure can help the patient to deal with their emotions before they become impediments in treating the disease. Emotional issues include denial, depression, anxiety and stress. Psychotherapy includes:

i. Cognitive-Behavioural therapy: this helps them to learn about their pattern of behaviour and teaches them how to adapt inner processes that contributes to feeling of depression.

ii. Interpersonal therapy: reviews personal relationship and crocks to eliminate friction and bad feelings.

iii. Behavioural therapy: through relaxation techniques and undergoing controlled exposure to source of anxiety.

iv. Group therapy: In groups, they can learn coping skills and share feelings in a supportive atmosphere.

Conclusion
Multiple studies have signified the benefit of exercises in improving muscular strength, flexibility and balance with subsequent functional improvement in individuals with Parkinson. Physical therapy along with Psychotherapy focuses on attainment of insight, overcoming denial/ limitation that the disease imposes. They help in maintaining and improving the social network of the patient. Exercise focusing on strength training, balance training, aerobic conditioning as well as use of external cues during gait can results in overall
improvement in motor performance and quality of life. According to studies, it is possible that intensive exercise contributes to brain repair and hence reversing the progressive functional damage of this disease.

References