THE ROLE OF PHYSIOTHERAPY

PRACTICAL APPROACH TO THE PATIENT WITH GAIT AND BALANCE DISORDERS

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This is a neurodegenerative disorder that is progressive in nature.

It is characterized by 4 main cardinal signs:
- Rigidity
- Tremor
- Bradykinesia
- Postural instability
PD leads to abnormalities in two main components of postural control:

- **Orientation**
  Maintaining a normal postural arrangement and alignment.

- **Stabilization**
  Maintaining equilibrium (Vaugoyeau & Azulay, 2010).
The most frequent orientation difficulty that PD patients present are:

- Stooped posture
- Moderate flexion of the knees and trunk,
- Bent or flexed elbows
- Adducted arms
Other postural abnormalities include

Antecolli

- This is marked or extreme neck flexion, minimum of 45°
- Patient is unable to fully extend the neck against gravity but able to exert force against resistance of the examiner’s hand.
Pisa syndrome

- Tilting of the trunk in the lateral plane, more than 10°, particularly when sitting or standing.
- Increasing during walking
- Not present when supine
- Back pain is a common feature (Gambarin et al., 2006)
Camptocormia
Abnormal posture of the trunk in the antero-posterior plane with marked flexion of the thoracolumbar spine. (Azher & Jankovick, 2005).
Postural Instability

PI is a disabling disorder, associated with:
- sudden falls
- progressive loss of independence
- immobility

(Grimbergen et al., 2004).

- It usually occurs at the later stages of the disease and responds poorly to medication.
It is in common in end-stage PD and compromises the ability to maintain balance during everyday tasks such as walking, turning and standing up from sitting.
Falls and freezing of gait in PD are closely intertwined.

Both symptoms are common in the advanced stages of the disease with freezing of gait leading to increasing falls.
Recent studies have shown that falls are common in Parkinson's disease, even when compared with other fall-prone populations.

The clinical impact of falls is considerable, often leading to an incapacitating fear of renewed falls.
The absence of adequately directed arm movements may explain the relatively high proportion of hip fractures secondary to falls in Parkinson's disease. (Bloem et al, 2004)
Also an inability to adequately balance the body's center of mass over the base of support, combined with inflexibility in body movements (increased rigidity) causes patients with advanced PD to fall.
Gait

Gait is the process of walking and relies on proper functioning from several areas of the body including the ears, eyes, brain, and muscles.

Gait disturbances in PD can be divided into episodic and continuous disturbances.

The episodic disturbances may occur randomly or intermittently and include start hesitation, festination and FoG.
Gait festination is progressive, whereby each step in a long gait sequence becomes progressively shorter, eventually leading to blocking.
Abnormal gait characteristics

- In normal gait, the heel strikes the ground before the toes (also called heel-to-toe walking)

- In Parkinsonian gait, motion is characterized by flat foot strike (where the entire foot is placed on the ground at the same time)

- Less often and in the more advanced stages of the disease there is toe-to-heel walking (where the toes touch the ground before the heel).
Balance

- Balance is needed within the context of many functional tasks of everyday living to keep the body oriented appropriately while performing voluntary activities, during external perturbations and when the support surface or environment changes (Bronte-Stewart et al., 2002).
Thus, impaired balance and PI occur mainly during walking, while maintaining upright stance and stability in, or when transferring from one position to another.
Falls

- Falls result mainly due to sudden changes in posture, in particular turning movements of the trunk, or attempts to perform more than one activity simultaneously with walking or balancing.

- Falls are also common during transfers, such as rising from a chair or bed. PD patients fall mostly forward (45% of all falls) and about 20% fall laterally.
FOG is one of the most disabling and least understood symptoms in Parkinson's disease, and is usually observed in the advanced stage of the disease.

FOG is a brief, paroxysmal event characterized by absence or marked reduction of forward progression of the feet despite the intention to walk. The patients generally feel their feet glued to the ground.

Dual tasking (cognitive load) aggravates FOG.
FOG can be experienced on
- turning
- narrow spaces
- whilst reaching a destination
- stressful situations.
FOG is commonly observed in the "off" state, but it can also be observed in the "on" state.
Some tests are used to assess gait and balance in PD patients.

- Functional reach test
- Berg Balance Scale
- Tinetti mobility scale
- Fall efficacy scale
- Ten-meter walk test
- Six-minute walk test
Freezing of gait questionnaire

This questionnaire constructed by Giladi et al. (Giladi et al., 2000) evaluates the FoG in patients with PD. This detailed gait and falls questionnaire consists of 16 items that assess gait in daily living, frequency and severity of FoG, frequency of festinating gait and its relation to falls, and finally frequency and severity of falls.

Responses to each item are on 5-point scales where a score of 0 indicates absence of the symptom, while 4 indicates the most severe stage (Giladi et al., 2000).
Exercise will not stop Parkinson's disease from progressing; but, it will improve balance and it can prevent joint stiffening.
It has been suggested that there are five key principles of exercise that enhance neuroplasticity in PD.
If exercise is introduced at an early stage of the disease, progression can be slowed.

Intensive activity maximizes synaptic plasticity.

Complex activities promote greater structural adaptation.
Activities that are rewarding increase dopamine levels and therefore promote learning/relearning.

Dopaminergic neurons are highly responsive to exercise and inactivity (“use it or lose it”); (Fox et al., 2006)
Exercises programs individually prescribed at home have been shown to be effective in reducing fall frequency among the elderly population. (Ashburn et al., 2007)

Exercises to improve balance can also help improve walking ability and improve safety when standing and walking,
Strengthening exercises to improve and maintain the integrity of muscles especially in the trunk, arm and legs also helps to improve coordination and smoothness of movement.

Endurance is usually compromised in PD hence exercises to promote cardiovascular and pulmonary fitness such as treadmill, stationary bike riding and arm endurance exercises can be taught.
Rigidity is a common symptom of PD and range of motion and flexibility exercises in the arms and legs can be taught to help improve tightness in the muscles and joints.
By consciously paying more attention to walking and rehearsing each step before actually making it, most patients are able to overcome FOG.

Sometimes, a companion walking alongside reminds the patient to concentrate on gait or they create a visual cue to step over by putting a foot in front of the person with PD over which the person must step.
Avoidance of dual tasks that require motor attention or cognitive attention has also been shown to normalize gait in the PD patients.

It is very important to exercise your facial muscles, jaw, and voice when possible: Sing or read aloud, exaggerating your lip movements. Make faces in the mirror. Chew food vigorously.
Training programs are designed

- To lengthen a patient's stride length
- Broaden the base of support
- Improve the heel-toe gait pattern
- Straighten out a patient's posture
- Increase arm swing patterns
Increasing stride length
Posture correction
Broadening base of support
Increasing arm swings
Due to PD’s progressive nature it is important to sustain an exercise routine to maintain its benefits.
Cueing is defined as using external temporal or spatial stimuli to facilitate movement (gait) initiation and continuation.
Recent reviews suggest that cueing has an immediate and powerful effect on gait performance in people with PD, improving:
- walking speed
- step length
- step frequency.
**Cues**

**Visual cues**
- The visual cues are commonly transverse lines or rods on the floor (floor markers). Such cues have been shown to improve stride length and velocity in Parkinsonian gait.

- Virtual reality glasses have also been developed recently to aid walking in PD patients.
Auditory cues

- The auditory cues are commonly rhythmic cues generated by a metronome or equivalent, and sometimes embedded in music, set at or slightly above the subject’s usual cadence.

- Rhythmic auditory cues have been associated with increases in velocity and cadence and sometimes stride after gait has been initiated.
Balance and fall prevention: Overview

- Keep at least one hand free at all times; try using a backpack or fanny pack to hold things rather than carrying them in your hands. Never carry objects in both hands when walking as this interferes with balance.

- Attempt to swing both arms from front to back while walking. This may require a conscious effort if Parkinson's disease has diminished your movement; however, it will help you to maintain balance, posture, and reduce fatigue.
Consciously lift your feet off of the ground when walking. Shuffling and dragging your feet may cause you to lose your balance.

When trying to navigate turns, use a "U" technique of facing forward and making a wide turn, rather than pivoting sharply.
Try to stand with your feet shoulder width apart. When your feet are close together for any length of time, you increase your risk of losing your balance and falling.

Do one thing at a time! Don't try to walk and accomplish another task, such as reading or looking around. The decrease in your automatic reflexes complicates motor function, so the less distraction, the better!
It may be advisable not to wear rubber or gripping soled shoes. They may "catch" on the floor and cause tripping.

Move slowly when changing positions. Use deliberate, concentrated movements and if needed, use a grab bar or walking aid. Count 15 seconds between each movement. For example, when rising from a seated position, wait 15 seconds after standing to begin walking.
If you become "frozen," visualize stepping over an imaginary object, or have someone place their foot in front of yours to step over. Try not to have a caregiver or companion "pull" you, this may throw you off balance and even prolong the episode.

If balance is a continuous problem, you may want to consider a walking aid such as a cane, walking stick, or walker. Once you've mastered walking with help, you may be ready to try it on your own again!
Socio-economic impact

- Mobility issues associated with falls and freezing of gait have a devastating impact in the lives of PD patients.
- Fear of falling in itself can have an incapacitating effect in PD patients and can result in social seclusion leaving patients largely isolated leading to depression.
Immobility can also lead to osteoporosis which in-turn facilitates future fracture development. This then becomes a vicious circle with falls leading to immobility and immobility facilitating future falls.

Hip fractures from falls are the most common form of fracture among PD patients. Fractures increase treatment costs for people living with PD.
References

References

GRAZIE !!!