

The clinical approach to gait disturbances in Parkinson's disease; maintaining independent mobility

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Summary. Gait is affected in all stages of Parkinson's disease (PD) and is one of the hallmarks for disease progression. The fear of getting into the wheel chair is one of the first thoughts many patients ask about when the diagnosis of PD is given. At the early stages of the disease gait disturbances are present and can be measured but in most patients it does not cause significant functional disturbances. In contrast, as the disease progresses, gait disturbances and postural control abnormalities are becoming major causes for lost of mobility and falls. These unfortunate consequences should be forecasted at the early stages of the disease and a preventive approach should be taken. Treatment of gait disturbances at the early stages of the disease is mainly to encourage patients to exercise and walk daily and by drugs in those with disabling symptoms. At the advanced stages, treatment should be aggressive in order to keep the patient walking safely. Drugs, physiotherapy and functional neurosurgery should be used wisely for best outcomes and least side effects. When time comes and the risk of falls is very significant, walking aids should be suggested and if no other option is left, wheel chair is a very reasonable option to maintain mobility out of home, preserving quality of life and avoiding falls with all its severe consequences.

Introduction

Gait disturbances are among the most important motor problems associated with Parkinson's disease (PD). They are the presenting symptom in 12–18% of the cases and will affect all patients as the disease progresses (Martin et al., 1973; Pahwa and Koller, 1997). Gait disturbances can lead to falls, insecurity, fear and loss of mobilization, independence, and institutionalization (Martignoni et al., 2004; Balash et al., 2005). Hoehn and Yahr in their original motor staging of PD already stated that most if not all patients will develop postural instability (stage 3) and gait disturbances (stage 4) as the PD progresses (Hoehn and Yahr, 2003). As such, prevention, delaying or treating parkinsonian gait disturbances should start right from the time of diagnosis and continue throughout the course of the disease. The therapeutic strategy should be based on the current understanding that postural instability and locomotion disorders will play a major role in the advanced stages when the fight to maintain mobility and independency will be at the base of the entire treatment. Another indirect factor in the battle for secured and independent walking is the mental state. Cognitive decline, anxiety or depression can affect the patient's drive as well as the interaction with the environment. Misjudgment of possible danger or true

obstacles in the environment or the patient's actual functional state can frequently lead to falls. Similarly, excessive fear of falling or panic attacks is frequently leading to avoidance behavior and self chosen "home arrest". Assessing and treating affective and cognitive aspects are pivotal factors in the fight to keep patients walking secured and independent.

Treating PD patients in general and gait disturbances in particular, should take into consideration the stage of the disease and the degree of disability.

Clinical approach when the risk to fall is low and mobility is well preserved

The clinical approach to the parkinsonian patient at the early stages of the disease when there are objective gait disturbances but their impact on daily function is still minor or moderate should be conservative. All patients at these stages are fully independent but are understandably worried about the future. The most common problems at the early stages are complaints of slow walk, shuffling gait and decreased arm swing, mainly on the more affected side of the body. These symptoms develop slowly and, as a result, most patients are not aware of the functional deterioration. It is frequently the spouse who first notices such changes and organizes the first appointment with the doctor. The fact that there is no significant disability and that the patient can adjust his/her daily activities according to the difficulties, can give the treating physician and the family the options if to treat the gait disturbances medically or physically. If medically, all antiparkinsonian drugs can ease some of the burden at this stage. If physically, a daily walk and exercise can give significant benefit and some times postpone the need for medications. Observing a disciplined regimen of daily exercise has many positive outcomes, several of which were mentioned above. It is a common belief that

exercise during the early stages of PD will delay or slow down physical deterioration and loss of mobility, even though such data has never been published base on class IA evidenced based research. The recommendation to exercise daily has additional benefits like paying attention to the general fitness and weight, building the muscles, and strengthening the bones. Furthermore, daily exercise is an active self dependent task which leaves some control in the patient's hands in addition to its positive effect on mood and cognition.

Based on the general knowledge that as PD will progress and that gait and balance problems will inevitably develop, a "delaying" approach should be taken from the time of diagnosis. The therapeutic plan should be geared to deal with the patient's general physical condition, general affective and cognitive aspects, strategies for the prevention of falls and associated injuries, as well as adopting a positive attitude of being active and taking responsibility in the fight for independency and mobility.

Many non-neurological problems can affect mobility and balance among these adult patients. They should be urged to aggressively treat any existing hyperlipidemia, diabetes mellitus, cardiac problems and hypertension (Skoog and Gustafson, 2003). They should be encouraged from the very early stages of the disease to keep their body weight down to BMI = 25 or less, considering the deleterious contribution of overweight to instability and immobilization (Mc Graw et al., 2000) as well as to brain dysfunction and the development of dementia (Gustafson et al., 2003). Special attention should be given to the feet, joints and spinal column because of the significant role of the musculoskeletal system in mobility and gait. In general, patients in the early stages of the disease do not realize the extent to which their general health status will effect their future mobility, and it is the responsibility of the neurologist to make the patient aware of these preventive aspects. This approach should be maintained throughout the

course of the disease, and every visit should start with a discussion on the assessment and control of non-neurological issues.

Gait disturbances and falls are closely related to the individual's affective state and cognition (Hoehn and Yahr, 1967; Adkin et al., 2003; Jantti et al., 1995; Whooley et al., 1999; Lenze et al., 2004). Depressed people fall and break bones as a result of their falls more frequently than non-depressed people (Jantti et al., 1995; Whooley et al., 1999; Lenze et al., 2004). Aggressive treatment of depression can have a significant impact on the willingness of the PD patient to exercise and take steps to enhance his/her physical fitness. It is vitally important to treat depression either medically or by psychosocial support or both. Among its many benefits, physical activity can also improve mood with its recognized positive consequences.

Dementia is a widespread complication of advanced PD and a significant contributing factor to the occurrence of falls. Dementia is the end result of many slowly progressive pathological processes, such as atherosclerosis, obesity, depression, lack of cognitive stimulation or head trauma. Treating all secondary risk factors can delay or slow down the rate of cognitive decline, with significant impact on the mental performance of PD patients at the more advanced stages of the disease.

Another aspect of delaying potential consequences of PD is the early detection and aggressive treatment of osteoporosis. Osteoporotic bone is significantly more vulnerable to injury, and even minor trauma can sometimes cause fractures that require surgery and lead to loss of mobility. All PD patients in all stages of the disease should be educated to assess their bone density regularly throughout the course of the disease and follow professional advice how to protect or treat osteoporosis.

Symptomatic medical treatment aimed specifically for gait disturbances should be given at the early stages only if it causes sig-

nificant disability or may lead to fall. A mild to moderate gait slowness or a decreased arm swing do not justify the use of drugs. In contrast, a history of frequent falls or shuffling gait with low ground clearance are dangerous and should be treated aggressively.

Clinical approach when the risk to fall is high and mobility is compromised

Disturbed gait and postural control represent major and very disabling aspects of advanced parkinsonism affecting most if not all patients (Hoehn and Yahr, 1967). Gait disturbances initially appear at the "Off" state, when dopaminergic treatment is less effective. As the disease progresses, even the "On" state is associated with gait and postural disturbances which classically manifest as short stride, low speed, shuffling gait as well as stooped posture and freezing of gait (FOG) or propulsion and festinations (Morris et al., 1994, 1996; Baatile et al., 2000; Giladi et al., 1992, 2001). In addition, significant gait dysrhythmicity with increased stride-to-stride variations (Schaafsma et al., 2003) and left/right steps asymmetry (Plotnik et al., 2005) has been recorded by sensitive gait assessment tools. The importance of those sub clinical measures is their predictability for FOG and falls (Bloem et al., 2004). Most gait disturbances can initially be improved up to the level of a normal gait during the "On" state when medications are effective. Other common problems of advanced parkinsonian stages are involuntary leg movements in the form of "Off" dystonia and "On" dyskinesia. At the advanced stages of parkinsonism, cognitive disturbances play a major role in the fight for mobility and independence without falls. Dementia can significantly influence the therapeutic options as well as the risk to fall.

Fine-tuning of the anti-parkinsonian medications can decrease the total daily "Off" time and "On" dyskinesia with a direct and immediate effect on secured mobility and stability.

Aside from optimal control and fine-tuning of “Off” and “On” periods, specific treatments can improve specific problems and non-motor disturbances that might have a significant impact on gait. Orthostatic hypotension, depression, and dementia should all be treated aggressively medically and behaviorally. All can be improved by medications and appropriate exercise and support with significant impact on patients mobilization safely.

At the most advanced stages of PD when “Offs” are very frequent and very disabling with dyskinesias which can cause major disability, functional neurosurgery at the level of the basal ganglia should be considered (Giladi and Melamed, 2000). Pallidotomy and deep brain stimulation of the sub-thalamic nucleus (STN) or the internal globus pallidum (GPi) have been very effective in avoiding motor response fluctuations with the elimination of “Off” periods and dyskinesias (Allert et al., 2001; Ferrarin et al., 2004).

Posture, balance, gait and transfers could be targeted by physiotherapists (Rubinstein et al., 2002; Plant et al., 1997). Physical therapy may induce small but significant improvements in gait speed and stride length (Plant et al., 1997). A sensory, cue-enhanced physical therapy program showed improvements lasting up to 3 months after the therapy had ended (Rubinstein et al., 2002; Nieuwboer et al., 1997).

General fitness can be maintained by daily exercise which should be recommended to every patient but even more persuasively to those at the more advanced stages of PD. A daily walk for 30–45 minutes during the “On” period is highly recommended for general health as well as for specific physical and mental needs. Daily walking has been shown to improve stride length and walking speed with a carryover effect of several months, even when the exercise was stopped (Sunvisson, 1997; Lokk, 2000; Scandalis et al., 2001).

Mobilization should be maintained for as long as possible but not at the price of risking

the individual to dangerous falls. Walking aids should be considered if drugs and behavioral treatment cannot maintain safe walking. Only rarely will the patient be the first to suggest the use of walking aids, so the obligation of raising this issue falls upon the doctor or the physical therapist. When walking becomes extremely difficult and dangerous and demands much effort and energy but does not substantially improve the patient’s quality of life, it is time to switch the patient’s mindset to now regard walking as an exercise without any mobilization goal. This is the time to introduce the use of wheelchair for actual mobilization and represents the end of the fight for ambulatory independence. When instability becomes a major risk for falls, walking aids can decrease the risk and preserve mobility. Use of a wheelchair is a practical and effective option when all others possible interventions have failed. Beside its stigma and lost of independency the wheelchair can let the patient get out of home and get every where in a safe and easy way.

Conclusions

Walking is affected by parkinsonism throughout the course of the disease. The most significant risk of gait disturbances in PD is falls with its deleterious consequences like fractures, fear of falling and “self chosen home arrest”. At the early stages of the disease when falls risk is low, patients and their care givers should be encourage to adapt healthy lifestyle, and instruct to treating all risk factors for atherosclerosis, dementia and deterioration of physical fitness. Daily exercise can be adopted at this stage to prepare for the future when physical deterioration is inevitable. As the disease progressed, and falls risk become a real danger medical, surgical, mental and physical interventions should be all aimed towards the preservation of independent mobilization and avoid falls. It is a long-term task, which needs a multidisciplinary team of neurologists, internists, ophthalmologists,

physical therapists, and many others. Beside the role of the multidisciplinary team it is the role of the patient and the caregivers to understand right from the early stages that voiding falls is a long term task which required constant attention and effort. Only when all forces are combined and talk with each others, falls can be delayed and even prevented.

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