

Visual Disturbances in Parkinson's Disease and Intervention

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Patients with Parkinson's disease may complain of vision problems such as reading problems, double vision, abnormal perception of motion (oscillopsia), and problems with eye tracking. Signs of problems may include nystagmus, ataxic ocular pursuits, slow and inaccurate saccades, reduced convergence and strabismus. Treatment options that include the use of partial selective occlusion, prism and lenses are discussed.



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Introduction. Parkinson's disease (PD) is a progressive degeneration of the neurons in the central nervous system that produce the neurotransmitter dopamine. Located in the substantia nigra, these neurons innervate the Caudate Nucleus and Putamen. The symptoms of PD are a direct result of dopamine depletion.

Primary symptoms of PD include tremor, rigidity, bradykinesia, difficulty in gait and ambulation, and difficulty in balance. Secondary issues include respiratory problems, dysphagia, dysarthria, depression, sleep disorders, speech disturbance, and visual problems.

Patients with PD may complain of vision problems. Common complaints include reading problems, double vision, abnormal perception of motion (oscillopsia), and problems with eye tracking. Since vision is our dominant sense, these symptoms can be quite troubling and interfere with many activities of daily living. Appropriate vision intervention can often help compensate for the problem and improve functional outcomes.

Review of Literature. Biousse et al¹ noted that patients with Parkinson's would commonly complain of impaired visual

function and difficulty with reading. Their study found that visual symptoms suggesting ocular surface irritation, altered tear film, visual hallucinations, decreased blink rate, and decrease convergence were more common in Parkinson's patients than in control subjects. Newman² writes that ocular signs in Parkinson's may mimic, but should not be confused with progressive supranuclear palsy. Clinical presentation includes blepharospasm and eye movement abnormality. Verhagen and Schimsheimer³ note abnormalities of the electro-retinogram and visual evoked potential in patients with Parkinson's. Muchnick writes that Parkinson's "may cause a loss of upward gaze, followed by downward gaze, and finally horizontal eye movements. Convergence may fail producing diplopia at near."⁴

Examination. A comprehensive ophthalmic exam with careful evaluation of ocular fixations, eye movements, and binocular vision is indicated for patients with PD. Signs of problems may include nystagmus, ataxic ocular pursuits, slow and inaccurate saccades, reduced convergence, and strabismus.

Nystagmus connotes an instability, or ataxia of ocular fixation. There are many

different types of nystagmus including, but not limited to rhythmic, horizontal, vertical, rotary, vestibular, congenital, and central.

The name refers to a description of the disorder, or source of origin. If nystagmus is acquired, such as in PD from a central dysfunction, the patient is generally not able to suppress the image generated from the abnormal eye movements. This results in oscillopsia, which is the abnormal perception of movement.

Ocular motor dysfunction (OMD) can manifest as ataxia of ocular pursuit, or slow and inaccurate saccades. When OMD is acquired such as in patients with PD, it is from a central cause. Associated symptoms include impairment of fine motor coordination and reading problems such as loss of place when reading and words appearing to move and jump when reading.

Convergence describes the ability of the eyes to accurately align on, and track an object as it moves closer to and away from the person viewing it. In convergence insufficiency the eyes lag behind the viewed object and are not able to track it as it approaches to closer than approximately 8 inches from the person. In mild cases this may cause only blurring and eye strain. As it becomes more pronounced there will likely be double vision at near.

Strabismus is a misalignment of the eyes. It can manifest intermittently, or constant, at distance and/or near, inward (eso), outward (exo), vertical (hyper, or hypo), or rotary (cyclo). It is commonly found with a Cranial Nerve III, IV, or VI ophthalmoparesis, or ophthalmoplegia and also with progressive external ophthalmoplegia. When acquired, such as in patients with PD, there will typically be double vision because of the inability to suppress central vision from the deviating eye.

Exotropia at near is the most common finding in patients with PD.

Treatment. The goal of treatment for vision problems is to find a functional solution to the patient's symptoms (double vision, oscillopsia, reading difficulty). Treatment should be relatively easy to employ, cost effective and functionally based.

Double Vision. Double vision is a serious and intolerable condition that is caused by strabismus, ophthalmoplegia, gaze palsy, and decompensated binocular skills. Prism, visual rehabilitation therapy, and surgery are options to help the patient recover binocular vision and alleviate the diplopia. Some patients may adapt to their strabismus by suppressing the vision of one eye, but this is rare in adult acquired onset. As a general rule, vision rehabilitation and surgery are not as helpful as prism for patients with PD because of the variable nature and central cause of motor dysfunction in PD.

Prism is an ophthalmic device that bends light. It is effective in compensating for diplopia in patients with PD because it can be prescribed to offset the amount of eye deviation. If the diplopia is only with near vision, then reading lenses with prism are indicated. This authors' experience is that an amount of prism between one half and two thirds of the measured ocular deviation is usually a sufficient and appropriate amount to prescribe. Using more than is necessary is counterproductive and may perpetuate the diplopia. If the double vision is only with far vision, then distance lenses with prism are prescribed. If there is double vision both distance and near, then either two separate prescriptions can be fabricated, or a Ben

1. Biousse V, et al. Ophthalmologic features of Parkinson's disease. *Neurology*. 2004;62:177-180.
2. Newman N. *Neuro-Ophthalmology A Practical Text*. Appleton & Lange. 1992:190,366.
3. Verhagen W, Schimshamer R. *Current Neuro-Ophthalmology*, Vol. 3. Eds. Lessell and Van Dalen. Mosby 1991:368-369.
4. Muchnick B. *Ocular Manifestations of Neurologic Disease*. Ed. Blaustein. Mosby 1996:101.

Franklin bifocal can be used. This is a lens that is manufactured from two separate lenses with different prism and lens prescriptions. One is made for far vision and the other for near vision. They are then cut in half and glued together to make a single bifocal lens.

If prisms and/or therapy are not successful and the patient does not suppress, intractable diplopia may occur. In these cases, and before current treatment strategies, complete patching of one eye has been used. While effective in eliminating diplopia, patching renders the patient monocular.

Monocular as opposed to binocular vision will affect the individual primarily in 2 ways; absence of stereoscopic depth perception and a roughly 25 percent reduction of the peripheral field of vision. These in turn cause problems in eye hand coordination, depth judgments, orientation, balance, mobility, and many activities of daily living such as playing sports, driving, climbing stairs, crossing the street, threading a needle, etc.

A new method of treating diplopia that does not have these limitations has been successfully developed by this author. It is called the "spot patch" and is a method used to eliminate intractable diplopia without compromising peripheral vision. It is a small, usually round or oval, patch made of Transpore tape, 3-M blurring film, or any other such translucent tape. It is placed on the lens of glasses directly in the line of sight of the deviating eye. The diameter is generally about 1 centimeter, but will vary on the individual angular subtense required for the particular strabismus, or gaze palsy. The spot patch works by blurring central vision, where diplopia is perceived, to a point where it is eliminated while preserving

peripheral vision.

Oscillopsia. Oscillopsia is the symptom of abnormal perception of movement, usually related to nystagmus, or abnormal pursuits without retinal suppression. Patients may acquire a varied head position and direction of gaze to help compensate by finding a null point where the nystagmus is decreased. Partial selective occlusion with bi-nasal, and/or bi-temporal patching can help dampen the perception of oscillopsia by enhancing a stable frame of reference. Rigid contact lenses can be used in a type of biofeedback mechanism to sometimes reduce nystagmus.

Reading Difficulties. Reading problems are one of the main causes for people seeking vision care. There are many causes and types of reading problems, and the specific treatment depends on an accurate diagnosis.

Convergence insufficiency may also impair reading ability. It can cause double vision, eyestrain, fatigue, or the appearance of words seeming to move and swim on the page when reading. For patients with PD effective treatment options include lenses and prism.

Accommodative deficiency may also cause reading problems. It can cause symptoms of blur, eyestrain, fatigue, or the appearance of words seeming to pulse and float on the page when reading. Lenses to assist accommodation are a good intervention.

Double vision will impair reading and should be treated as noted above.

Saccadic (scanning) movements are required for efficient reading. When slow and/or inaccurate they will impair reading. This can cause loss of place, skipping lines,

type of mask measuring about 10 centimeters long by 5 centimeters wide, and is made from heavy card stock paper. It has a slit cut in it approximately 8 centimeters long and 1 centimeter wide. It is placed over reading material to isolate the line being read.

Conclusion. Parkinson's disease mainly affects vision through motor dysfunction. Patients frequently complain of vision problems including difficulty with reading, double vision and the abnormal perception of movement. Examination may reveal the diagnoses of nystagmus, ocular motor dysfunction, convergence insufficiency and/or strabismus. Treatment options including lenses, prism and partial selective occlusion are effective and affordable means to treat these conditions.

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