

Parkinson's Disease and the Eye

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Introduction

- PD affects over 1 million Americans
- 60,000 new patients/year
- 10 million worldwide with PD
- 1-2% of the population over 60-years-old
- 10% are under 50 yo
- Symptoms: tremor, rigidity, bradykinesia, impaired balance



Visual Complaints in PD

- 75% of PD patients have oculomotor signs
- 75% blepharitis
- 2/3 dry eyes
- 25% visual hallucinations
- Common symptoms:
 - Blurred vision, double vision, light sensitivity, eye strain, reading difficulties



FoxFeed Blog

Tracking Eye Movement to Diagnose Parkinson's

Posted by Kat McCarrick, September 19, 2016

Tracking Eye Movement to Diagnose Parkinson's

The Michael J. Fox Foundation for Parkinson's Research (MJFF) recently awarded a \$1 million grant to The Virginia Commonwealth University (VCU) Schools of Medicine and Engineering to test a tool for diagnosing Parkinson's disease (PD). Currently, there is no objective measurement (such as a blood test) doctors can use to definitively diagnose Parkinson's disease. Researchers at VCU have developed a non-invasive eye test that could potentially inform whether someone has Parkinson's disease.

Using infrared lights, the test tracks the eye movements of a person as they stare at a screen and follow prompts. Eye movements typically follow very distinct patterns. In Parkinson's disease, the loss of cells that use dopamine (a brain chemical) to coordinate movement can cause alterations in these patterns. While these changes may be unnoticeable to a casual observer, they could be detected with more sensitive eye testing, such as that used by VCU researchers.

With the support of MJFF, the VCU team will replicate their research in additional academic centers in order to verify that the test is in fact able to accurately diagnose Parkinson's. In addition, they hope to prove that the test can detect Parkinson's before physical symptoms are present. Earlier and more precise diagnosis would allow doctors to begin disease-targeted therapies before the disease progresses and could also prevent misdiagnosis.

Dopamine and the Eye

- Primary sites of pathology
 - Loss of dopamine cells in substantia nigra compacta of midbrain and putamen
- Secondary sites
 - Dopamine depletion in visual cortex and retina



Neuro-ophthalmic Deficits

- *Pareses of gaze*
- *Accommodation paresis*
- *Reflex blepharospasm and blepharoplegia*
- *Keratitis sicca*
- *Infrequent blinking*

Neuro-ophthalmic Deficits

- *No hemianopsia*
- *Sensory abnormalities*
- *Oculogyric crises*
- *No nystagmus or dementia*
- *Signs*

Pareses of Gaze

- Slow, hypometric saccades with incomplete upgaze
- Jerky “cogwheel” pursuit
- L-dopa improves saccadic amplitude
- On-off effects may affect eye movements
 - hypermetric saccades

Impaired Eye Movements in PD during Reading

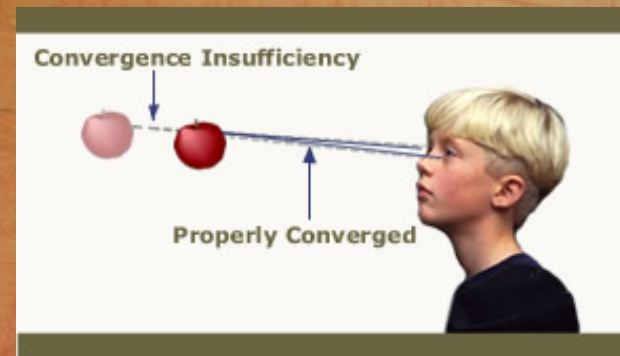
For individual veterans, private care could mean shorter waits, more choices and fewer requirements for co-pays — and could prove popular. But some health care experts and veterans' groups say the change, which has no separate source of funding, would redirect money that the current veterans' health care system — the largest in the nation — uses to provide specialty care.

Pareses of Gaze

- Parkinson's imitators
 - If dramatically slow saccades or impaired downgaze, consider
 - Progressive supranuclear palsy (PSP)
 - Corticobasal degeneration (CBD)
 - Olivopontocerebellar degeneration
 - Poor response to L-dopa

Accommodative Paresis

- Impaired focusing at near results in double vision and reading problems
- May result from anticholinergic medications for tremor (Artane, Cogentin, benedryl)
- Convergence insufficiency causes double vision or eye strain



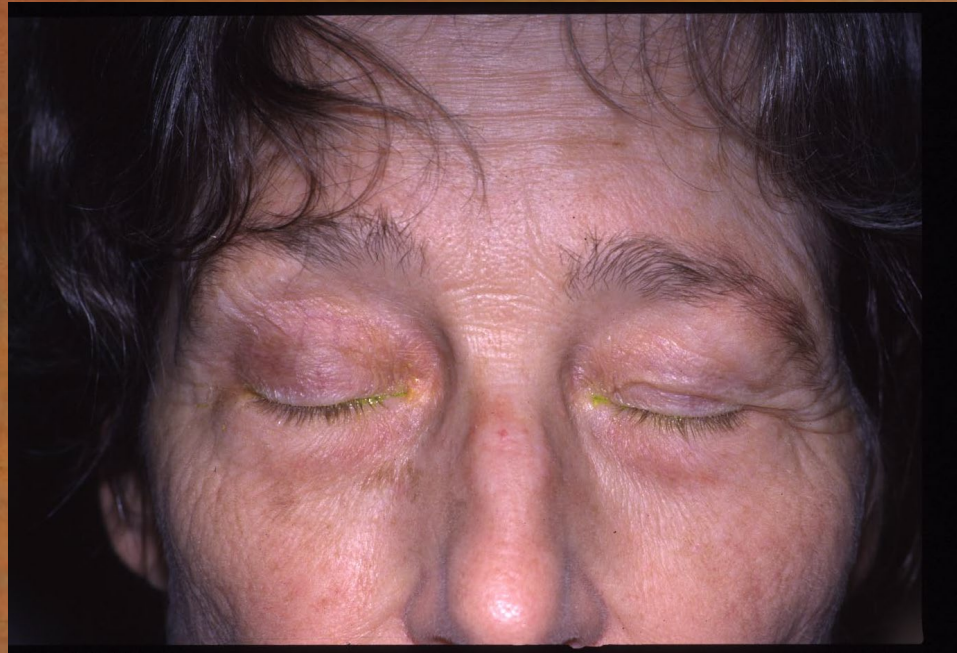
Reflex Blepharospasm and Blepharoplegia

- Inability to open the eyes due to
 - Blepharospasm
 - Apraxia or eyelid opening
 - Avoidance of double vision
 - Dry eyes

Blepharospasm

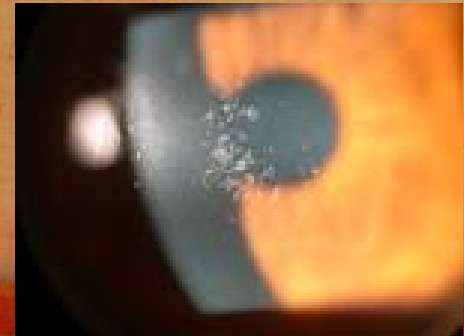


Apraxia of Eyelid Opening



Keratitis Sicca (Dry Eyes)

- Results in eye pain and blurred vision
- Multiple factors include
 - Infrequent blinking
 - Seborrheic dermatitis
 - Decreased tears from medications and autonomic dysfunction



Seborrheic Dermatitis



Infrequent Blinking

- PD blink rate may be 1-2/minute (normal 16-18/minute)
- Creates expressionless stare
- Complicates management of dry eye syndrome

Parkinson's Stare



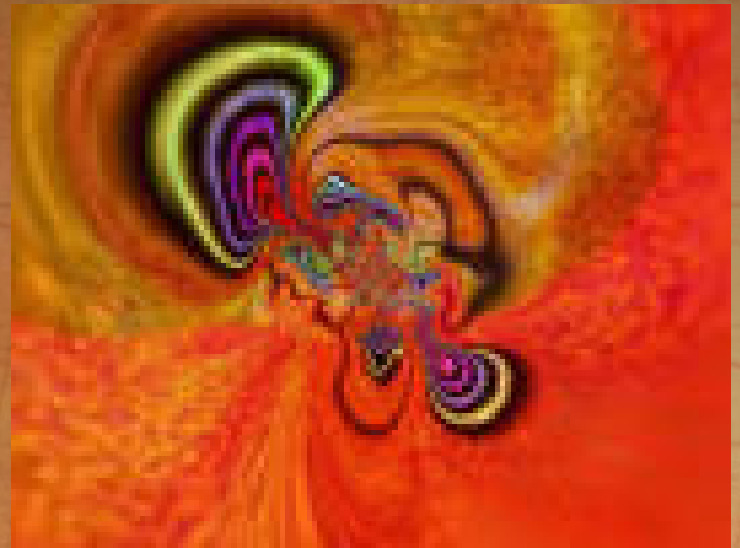
No Hemianopia

- No visual field defects in PD except post-pallidotomy
- Early pallidotomy patients had 40% incidence of homonymous hemianopia
- Modern pallidotomy results in 5-10% of superior quadrantanopsia



Sensory Abnormalities

- Impaired contrast sensitivity common
- Poor color discrimination in blue/yellow axis
- Hallucinations in 25-40% of PD patients
 - Usually older patients, on medications, with poor vision



Oculogyric Crises

- Common with post-encephalitic PD
- Side-effect of neuroleptic drugs
- Painful forced, upward turning of both eyes



No Nystagmus or Dementia



- Nystagmus is not seen in idiopathic PD
- Dementia not seen in young-onset PD, but may be seen in elderly PD patients

Signs

- Myerson's sign
 - Failure of the blink reflex
- Wilson's sign
 - The need to blink to change direction of gaze
 - Hypometric saccades, jerky smooth pursuit with catch up saccades

Diffuse Lewy body disease

- Frequent visual hallucinations (2/3 of patients)
- Visuospatial disturbances

Multisystem Atrophy

Square wave jerks

Impaired smooth pursuit

Gaze evoked nystagmus

MSA-C > MSA-P

Hypometric saccades

Progressive supranuclear palsy

- Slow voluntary saccades (vertical > horizontal)
- Supranuclear gaze palsy
- SQW jerks
- Blepharospasm
- CI

PSP



University of Utah
John A. Moran Eye Center



Corticobasal ganglionic degeneration (CBGD)

- Gaze palsies (V = H)
- Visuospatial dysfunction
- Blepharospasm and AEO

Management of Eye Problems

- Review the history of eye complaints
 - Time spent reading
 - Computer usage
 - Medication on-off effects
 - Use of anticholinergics or antidepressants (dry eyes and hallucinations)

Eyeglasses Issues

- Refraction with headrest or trial frame
- Use spherical equivalent for astigmatism
- Separate glasses for near, intermediate, and distance
- IDEALLY NO BIFOCALS OR TRIFOCALS
- If patient demands bifocals
 - no progressive lenses



Eyeglasses Issues

- Generous reading add for young PD patients
- For convergence and divergence insufficiency
 - Base-out prisms for distance
 - Base-in prisms for near
- Translucent occlusion of one lens



Treatment of Eyelid Problems in PD

- Blepharospasm and apraxia
 - More common with PSP
 - BOTOX trial
- Blepharitis
 - Lid-scrub pads
 - Non-preserved artificial tears
 - Punctal plugs for abnormal Schirmer's test



BOTOX Injections for Blepharospasm

Before



After



Reading Tricks in PD

- Use finger as placeholder
- Use a music stand or cookbook holder so hand tremors won't interfere
- Use the computer with large font



Conclusions

- Many of the abnormalities of vision with PD can be addressed and improved
- Preservation of sight is crucial to maintaining the dignity and integrity of the PD patient
- PD patients should find an empathetic and patient eye care provider

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