

# The Impact of PD on Vision

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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

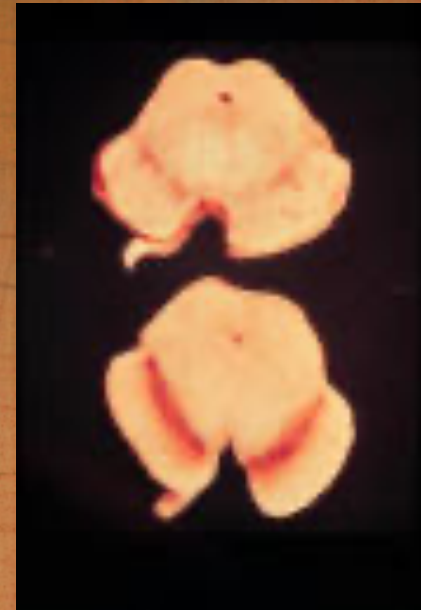
### Tracking Eye Movement to Diagnose Parkinson's

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.

# 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

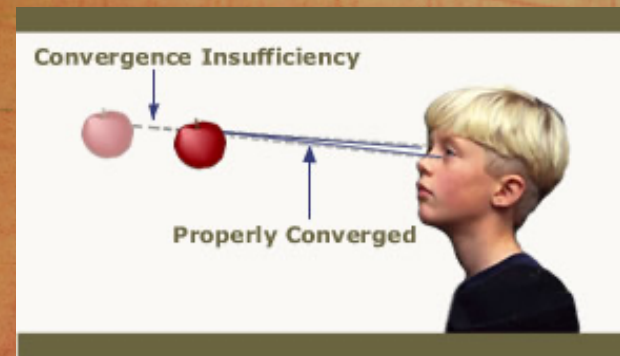
- RESEARCH ARTICLE **Slower saccadic reading in Parkinson's disease** Naz Jehangir<sup>1</sup> , Caroline Yizhu Yu<sup>1</sup> , Jeehey Song<sup>1</sup> , Mohammad Ali Shariati<sup>1</sup> , Steven Binder<sup>1</sup> , Jill Beyer<sup>1</sup> , Veronica Santini<sup>2</sup> , Kathleen Poston<sup>2</sup> , Yaping Joyce Liao<sup>1,2\*</sup>
- The slower reading speed during word reading was due to increased number of progressive saccades, smaller saccade amplitudes, increased number of regressive saccades, and longer fixation durations.

# 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

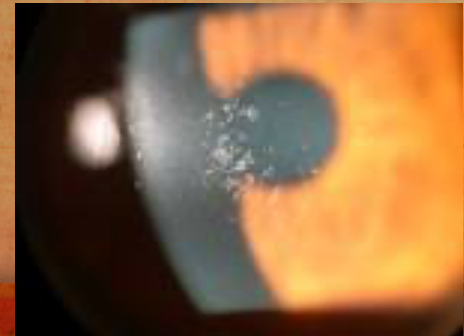


# Apraxia of Eyelid Opening



# 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



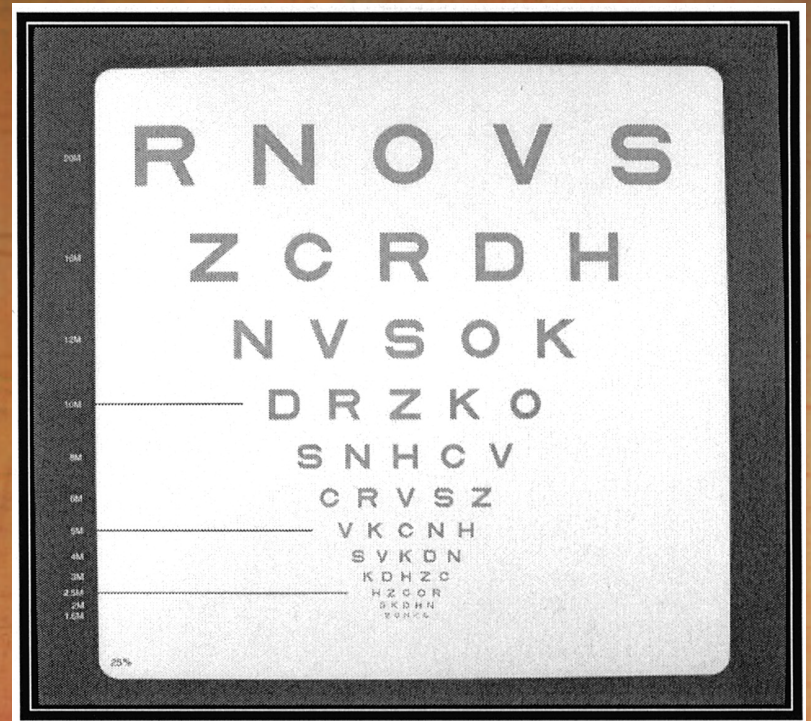
# No Hemianopia

- 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



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# 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

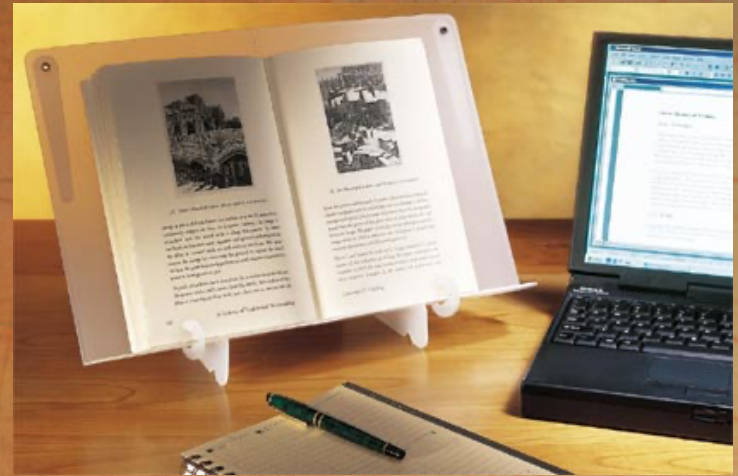


After



# 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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