

IOWA

Departments of Neurology
and Ophthalmology & Visual
Sciences

Visual Assessment & Interventions in Stroke Patients

PEARLS FOR THE VASCULAR NEUROLOGIST

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Iowa Stroke Conference
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Iowa Stroke Conference - 2024

Disclaimer

→ [Medicine.uiowa.edu/neurology/](https://medicine.uiowa.edu/neurology/)

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No disclosures.



Objectives

Describe

Describe patient interventions and modifications used to increase independence of the post-acute stroke patient as it relates to mobility, ADLs and communication

Understand

Understand the unique characteristics of posterior circulation strokes and how it pertains to functional outcomes

Learn

Learn how to approach the patient with stroke and visual deficits and know the resources available

Vision and Stroke

T O
L P E D
P E C F D
E D F C Z P

F E L O P Z D

D E F P O T H O

Epidemiological Facts

1

Stroke is No. 1 cause of long-term disability and 5th leading cause of death in the United States

2

87% are ischemic strokes

3

25.4% of patients with an ischemic stroke reported some type visual deficit

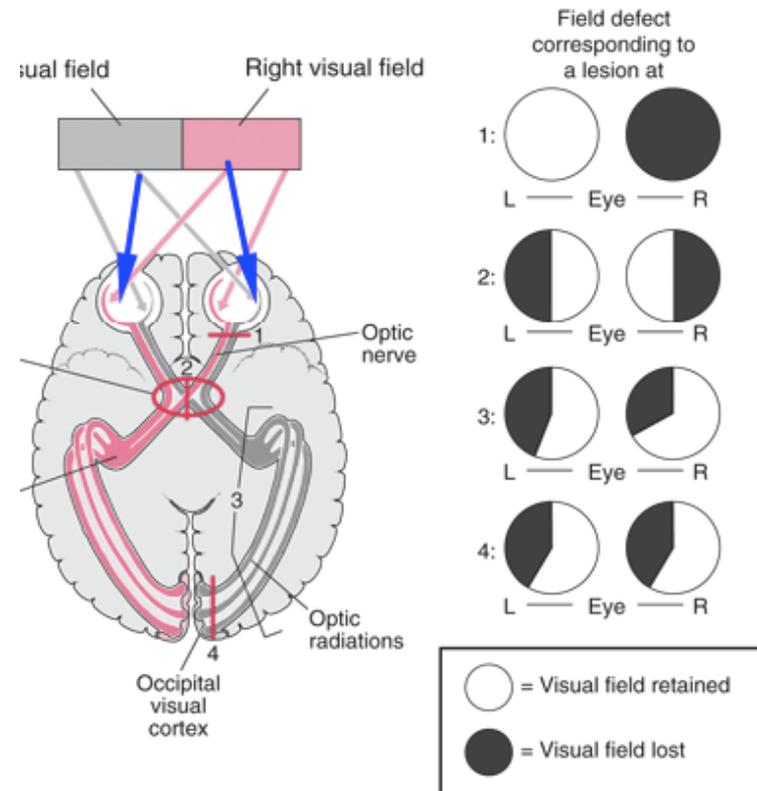
4

Visual deficits:

- Visual field defects
- Monocular vision loss
- Gaze palsies
- Inattention w/neglect

Visual Field Defects

- Hemianopia
 - Homonymous
 - Non-homonymous
- Quadrantanopia
- Monocular vision loss or ipsilateral changes



Neuroanatomical Localization



Anterior circulation strokes (ACs)

ICA --> ophthalmic artery
Ipsilateral or monocular vision loss



Posterior circulation strokes (PCs)

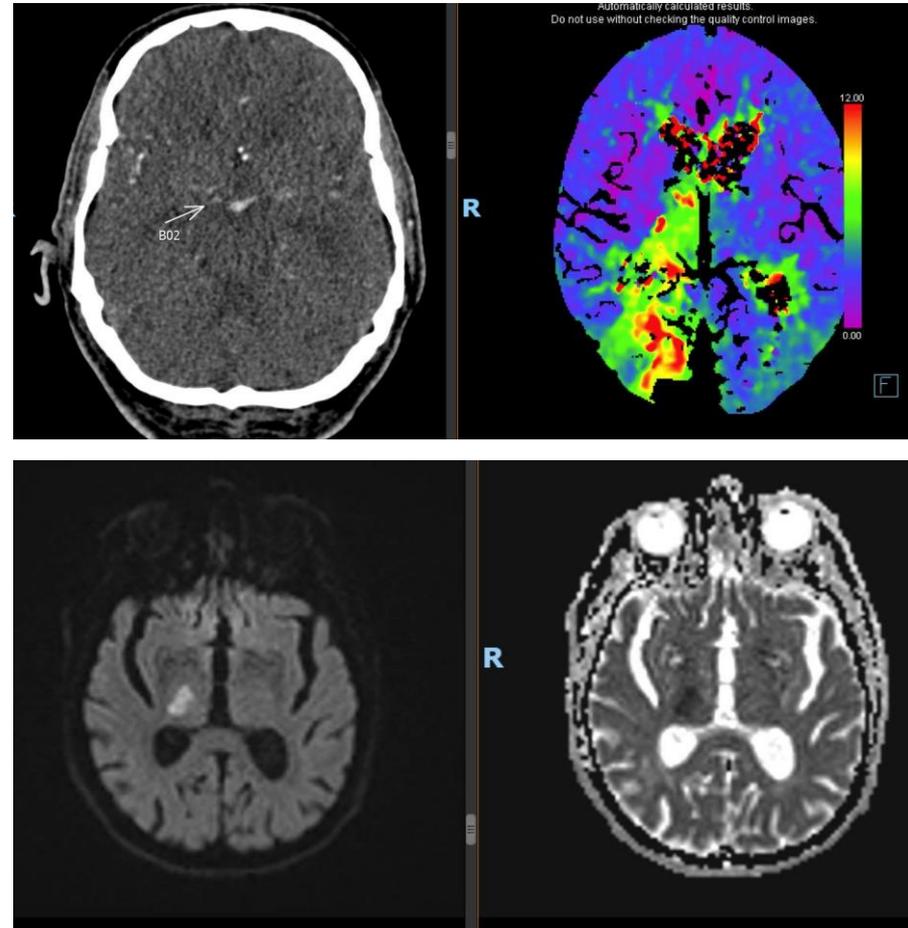
PCA or vertebrovascular region
Binocular VF defects
Ocular motor symptoms

Clinical Scenarios



CASE 1

- 75 year-old man
- PMH of HTN, HLD, T2DM
- Presented left sided weakness and left sided numbness, dysarthria, tactile and visual neglect on L
- NIHSS 12
- TPA administered



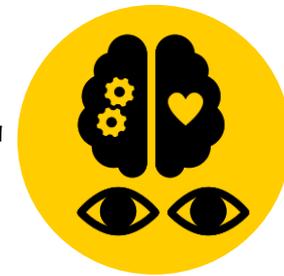
Plan and Referral Chain



Neurology



Physical Therapy



**Neuro-
Ophthalmology**

Eye Exam

Base Eye Exam

Visual Acuity (Snellen - Linear)

	Right	Left
Dist sc	20/50 -1	20/30 -2
Dist ph sc	20/30 -2	NI

Tonometry (Tonopen, 2:35 PM)

	Right	Left
Pressure	14	11

Pupils

	Dark	Light	Shape	React	APD
Right	2.5	2	Round	Brisk	None
Left	2.5	2	Round	Brisk	None

Eye Exam

External Exam

	Right	Left
External	Normal	Normal

Slit Lamp Exam

	Right	Left
Lids/Lashes	meibomian gland dysfunction; papillomatous lesion on medial aspect of RUL	meibomian gland dysfunction
Conjunctiva/Sclera	Clear and quiet	Clear and quiet
Cornea	Clear	Clear
Anterior Chamber	Deep and quiet	Deep and quiet
Iris	Normal architecture	Normal architecture
Lens	3+ nuclear sclerosis, 1+ cortical cataract, 1+ posterior subcapsular cataract, vacuoles	3+ nuclear sclerosis, 1+ cortical cataract, 2+ posterior subcapsular cataract, cortical spokes, vacuoles,
Vitreous	asteroid hyalosis	asteroid hyalosis

Eye Exam

Fundus Exam

	Right	Left
Disc	Normal	Normal
C/D Ratio	0.5	0.3
Macula	Small preretinal hemorrhage just IT to disc margin	Normal
Vessels	Normal	Normal
Periphery	Normal	Normal

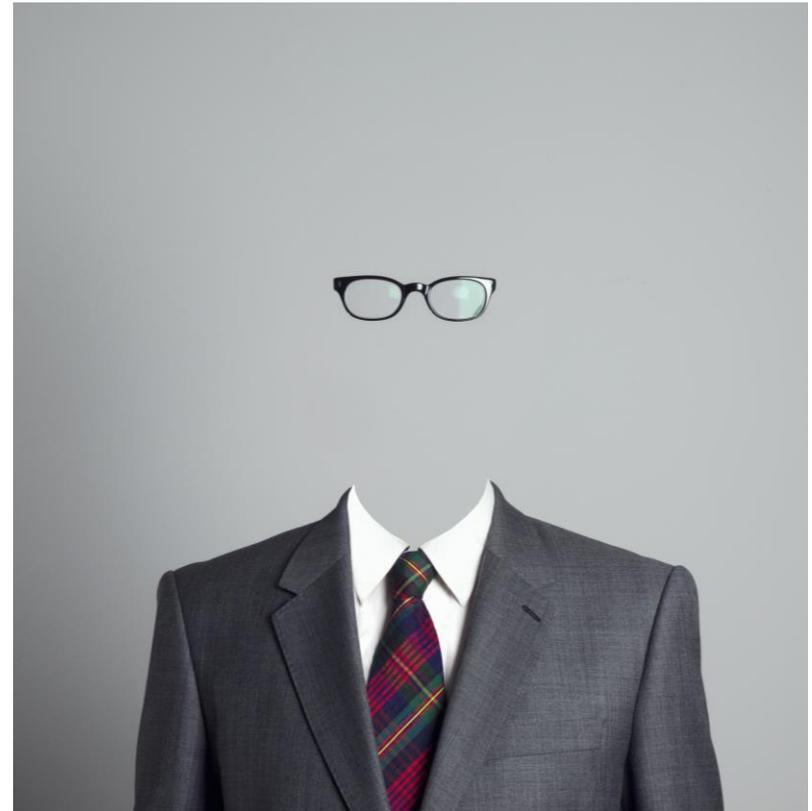
Refraction

Manifest Refraction (Auto)

	Sphere	Cylinder	Axis
Right	-2.75	+2.50	033
Left	+0.25	+1.25	180

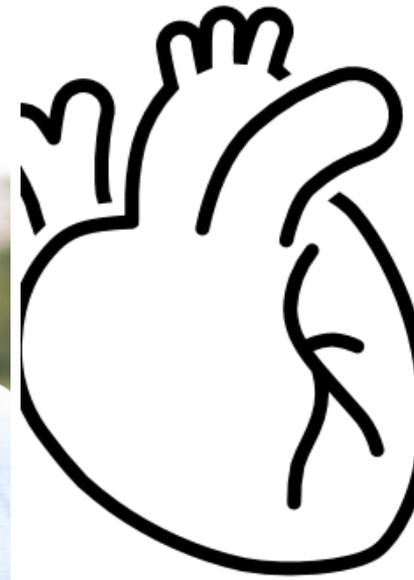
Next Steps?

1. Visual rehab
2. New glasses
3. Driving assessment
4. Driving restriction
5. Low vision referral
6. Occupation therapy
7. More physical therapy
8. All of the above?



Case 2

- 30 year-old man
- PMH congenital cardiomyopathy and mechanic aortic valve on Warfarin and migraine with aura
- Presented after 5 days of persistent migraine with aura after lifting weights



Eye Exam

Base Eye Exam

Visual Acuity (Snellen - Linear)

	Right	Left
Dist cc	20/20-2 +1	20/20 -1
Dist ph cc	20/20	

Correction: Glasses

Tonometry (Tonopen, 12:39 PM)

	Right	Left
Pressure	15	15

Pupils

	Dark	Light	Shape	React	APD
Right	4	3	Round	4	None
Left	6	5	Round	4	None

OD 7.2 OS 7.2 RAPIDO 0.2 R

No light near dissociation

Eye Exam

Strabismus Exam

Method: Alternate Cover

Correction: cc

Distance	Near X' 4	Near +3DS	N Bifocals
----------	--------------	-----------	------------

	0 0 +1	X 1	+1 0 0	
Ortho	0  0	Ortho	0  0	Ortho
	0 0 0	Ortho	0 0 0	

R Tilt	L Tilt
Ortho	Ortho

Eye Exam

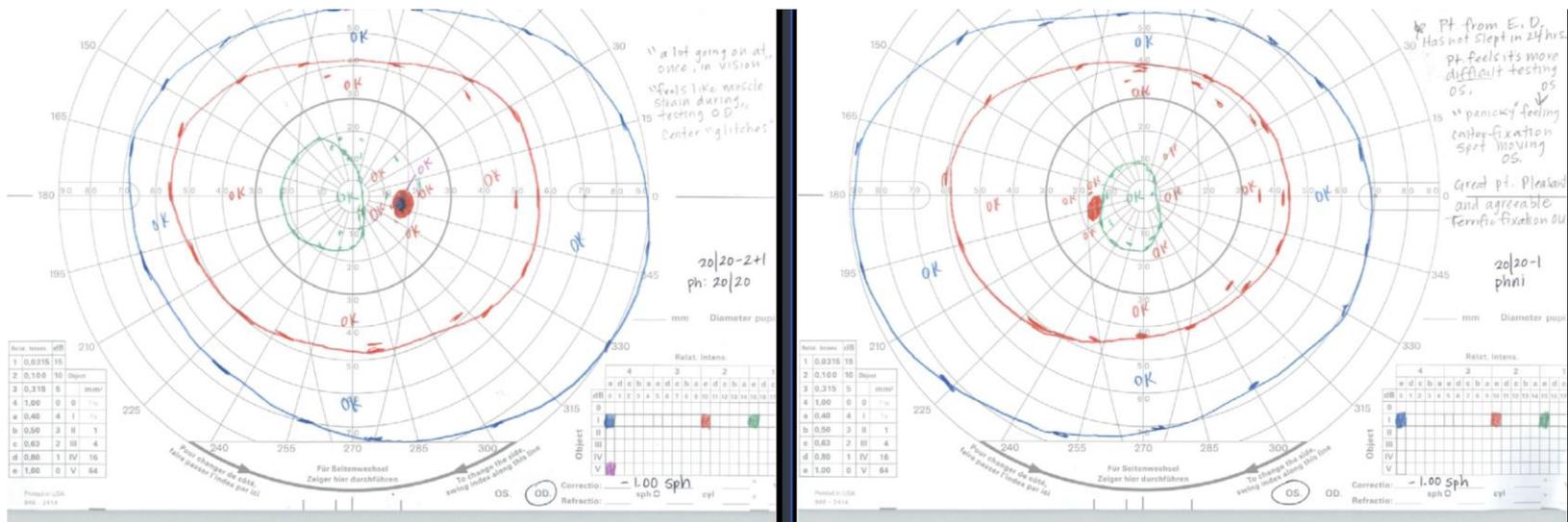
Slit Lamp Exam

	Right	Left
Lids/Lashes	no ptosis	no ptosis
Conjunctiva/Sclera	Clear and quiet	Clear and quiet
Cornea	Clear	Clear
Anterior Chamber	Deep and quiet	Deep and quiet
Iris	Normal architecture	Normal architecture
Lens	Clear	Clear
Anterior Vitreous	Normal	Normal

Fundus Exam

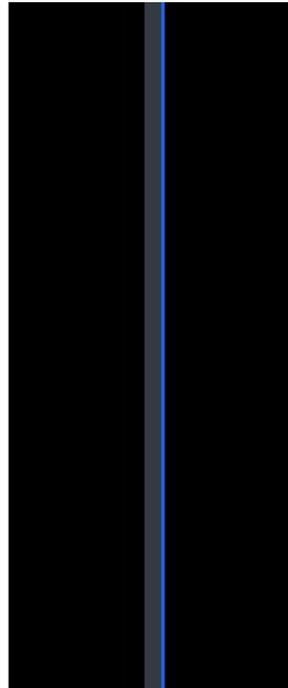
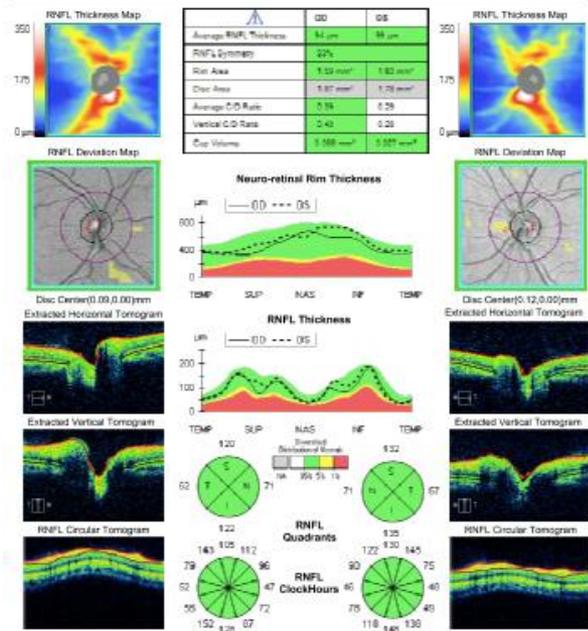
	Right	Left
Disc	Normal	Normal
C/D Ratio	0.3	0.2
Macula	Normal, few small drusen in the posterior pole	few small drusen in the posterior pole
Vessels	Normal	Normal
Periphery	Normal	Normal

Goldmann Visual Field

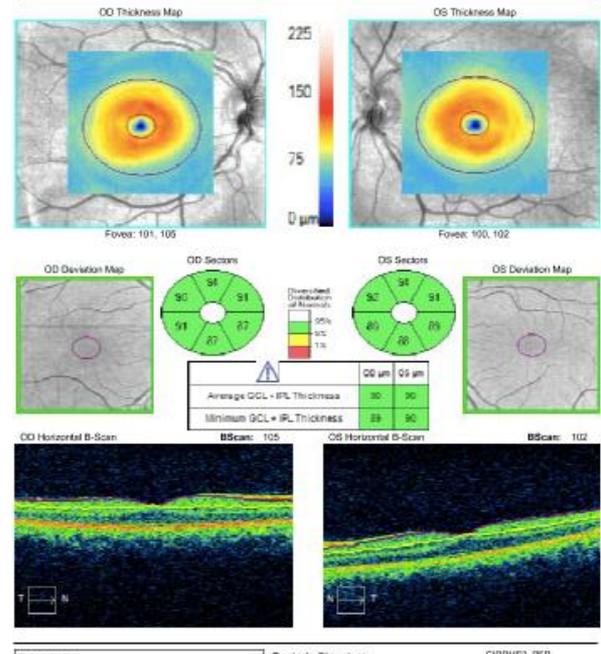


OCT RNFL AND GCL

ONH and RNFL OU Analysis: Optic Disc Cube 200x200 OD OS



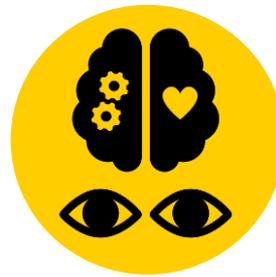
Ganglion Cell OU Analysis: Macular Cube 200x200 OD OS



Plan and Referral Chain



Optometrist

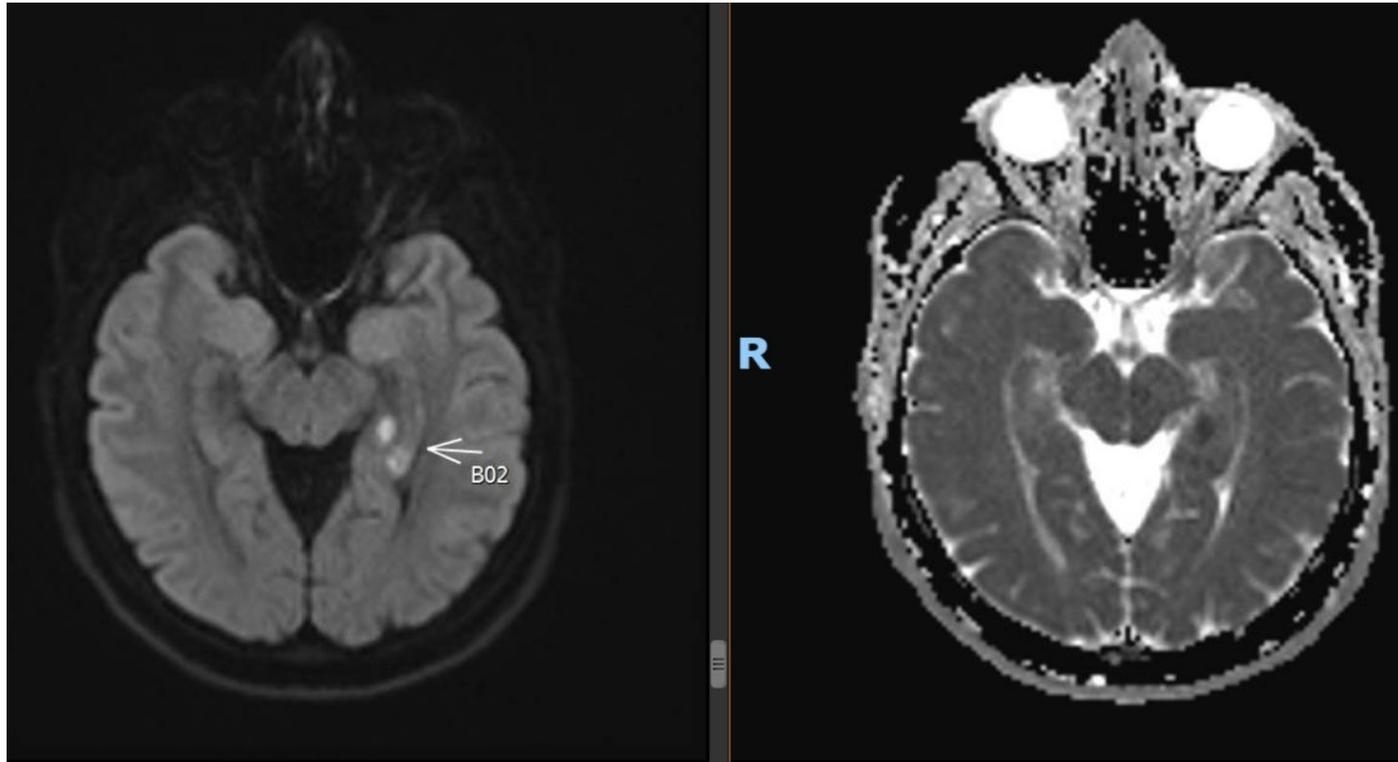


**Neuro-
Ophthalmologist**



Neurology

MRI Brain DWI/ADC



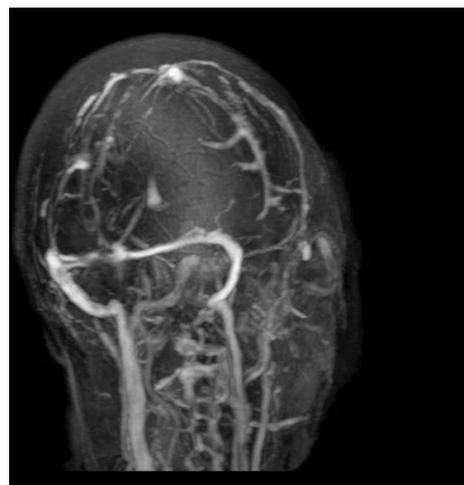
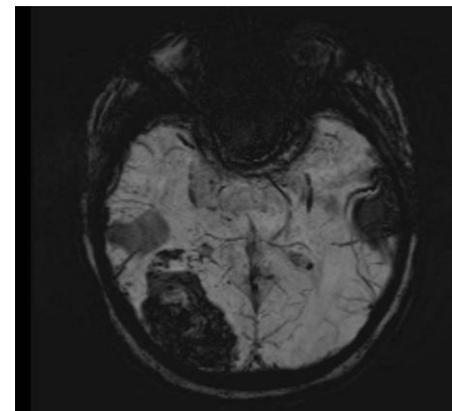
Next Steps?

1. Visual rehab
2. New glasses
3. Driving assessment
4. Driving restriction
5. Low vision referral
6. Occupation therapy
7. More physical therapy
8. All of the above?



Case 3

- 66 year-old woman
- PMH hypothyroidism
- POH amblyopia OS
- Presented with 1 week of bifrontal, throbbing headache; balance and tongue numbness
- SSS and confluent sinus thrombosis
- Factor V Leiden heterozygous mutation



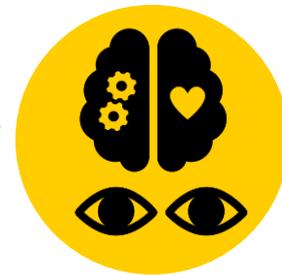
Plan and Referral Chain



**Emergency
Department**



Neurology



**Neuro-
Ophthalmologist**



Neuro-Op Evaluation

Base Eye Exam

Visual Acuity (Snellen - Linear)

	Right	Left
Dist sc	20/40 +1	20/80 +2
Dist cc	20/20 -2	
Dist ph sc	20/20 -2	20/70 -1

Correction: Glasses

Tonometry (Tonopen, 10:06 AM)

	Right	Left
Pressure	18	18

Pupils

	Dark	Light	Shape	React	APD
Right	5	4	Round	Brisk	None
Left	5	4	Round	Brisk	None

OD 6.7 OS 6.9 RAPIDO 0.2 L

Neuro-Op Evaluation

Slit Lamp and Fundus Exam

External Exam

	Right	Left
External	Normal	Normal

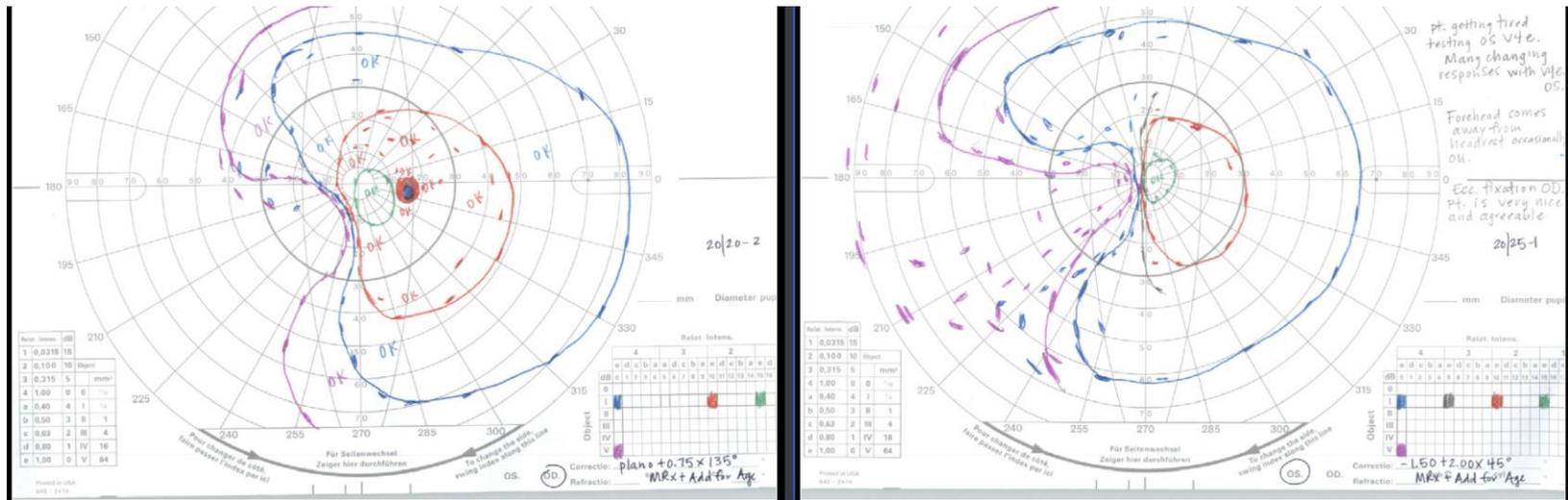
Slit Lamp Exam

	Right	Left
Lids/Lashes	Normal	Normal
Conjunctiva/Sclera	Clear and quiet	Clear and quiet
Cornea	Clear	Clear
Anterior Chamber	Deep and quiet	Deep and quiet
Iris	Normal architecture	Normal architecture
Lens	2+ NS	PCIOL
Vitreous	Normal	Normal

Fundus Exam

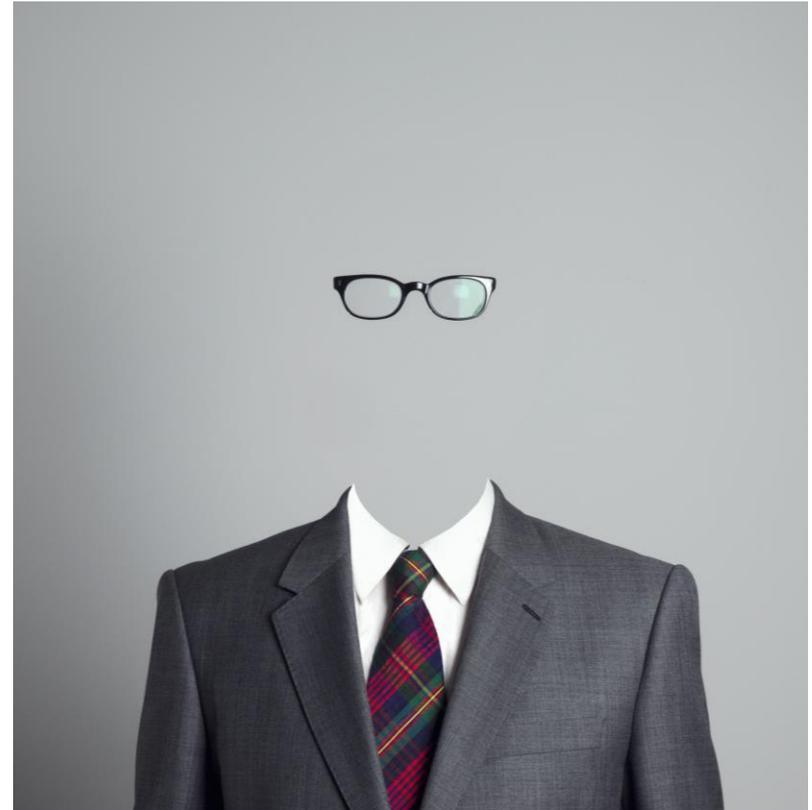
	Right	Left
Disc	Normal; large cup; no edema or pallor	Normal; large cup; no edema or pallor
C/D Ratio	0.65	0.8
Macula	Normal	Normal
Vessels	Normal	Normal
Periphery	Normal	Normal

Goldmann-Visual Field

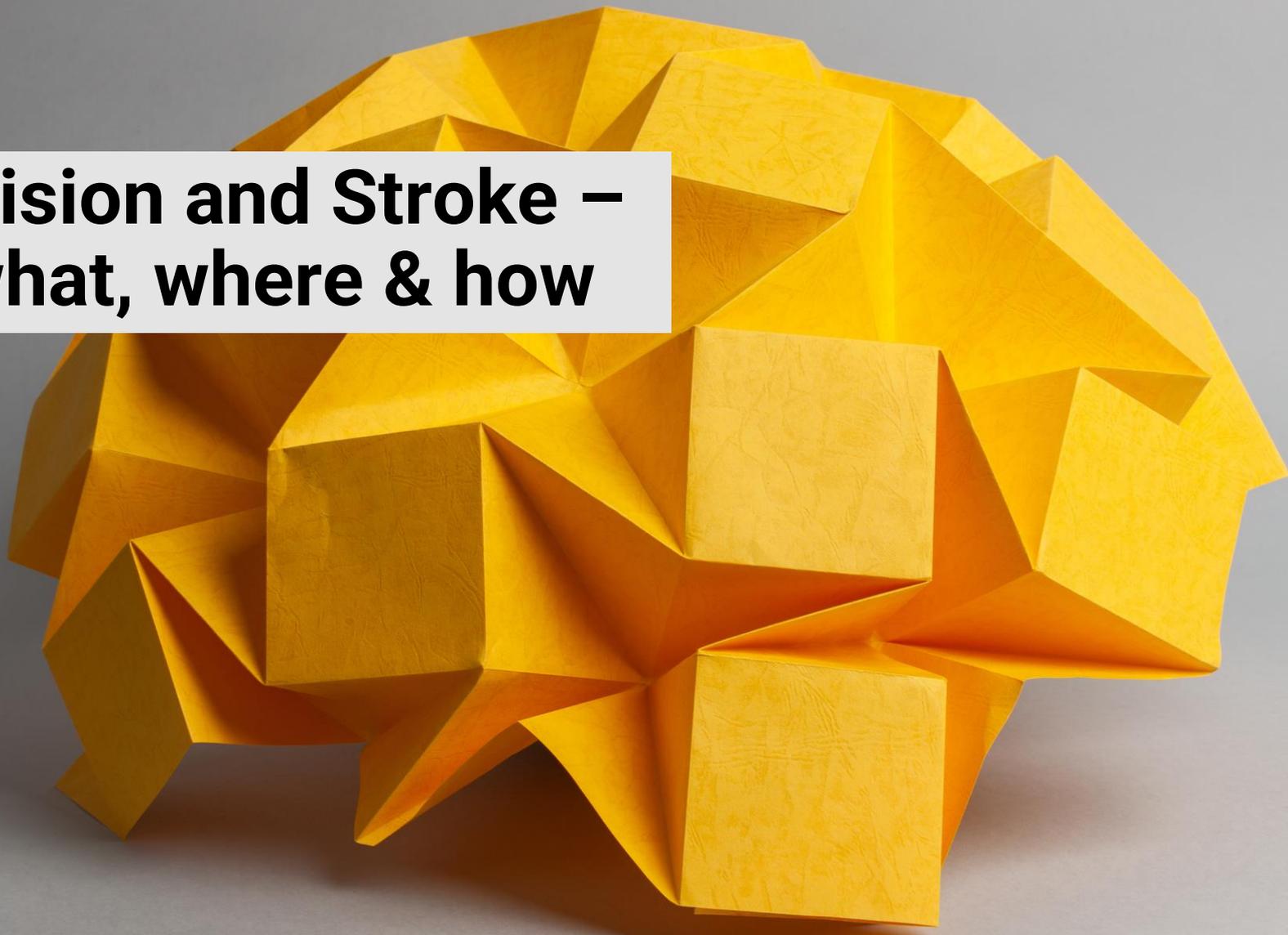


Next Steps?

1. Visual rehab
2. New glasses
3. Driving assessment
4. Driving restriction
5. Low vision referral
6. Occupational therapy
7. More physical therapy
8. All of the above?



Vision and Stroke – what, where & how



Posterior Circulation Strokes

Underrepresented in the NIHSS

46% of infarcts were confined to the occipital lobe

54% had concurrent infarcts involving other parts of the brain

Infarcts in the thalamus significantly correlated with the presence of non-visual symptoms

Significant correlation between P1, P2 cutoffs and thalamic infarcts (P=0.0078)

VF deficits but also motility deficits

PCS Facts

Patients with visual deficits experience greater risk of falling and depression

Post-stroke rehabilitation is more challenging

Lack of recognition of symptoms

DRIVING

Evidence suggests that these patients are 4 times more likely to have a poor functional outcome at 90 days

Overall lower quality of life

Visual Rehabilitation

Some visual deficits may improve slightly over time

Vision rehab may help speed up the process

Visual Search training --> highest improvement in functional ability

Visual neglect leads to more difficulties in rehab

Gaze palsy and other motility issues can present with diplopia

Other layers: prior ophtho Hx (cataracts, glaucoma, etc)

Saccadic visual search training: a treatment for patients with homonymous hemianopia

A L M Pambakian¹, S K Mannan, T L Hodgson, C Kennard

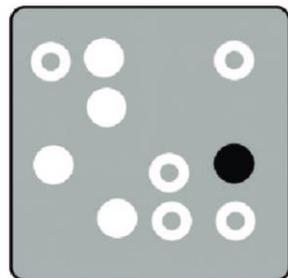
Objectives: We describe a novel rehabilitation tool for patients with homonymous hemianopia based on a visual search (VS) paradigm that is portable, inexpensive, and easy to deploy. We hypothesised that by training patients to improve the efficiency of eye movements made in their blind field their disability would be alleviated.

Methods: Twenty nine patients with homonymous visual field defects (HVFD) without neglect practised VS paradigms in 20 daily sessions over one month. Search fields comprising randomly positioned target and distracter elements, differing by a single feature, were displayed for three seconds on a dedicated television monitor in the patients' homes.

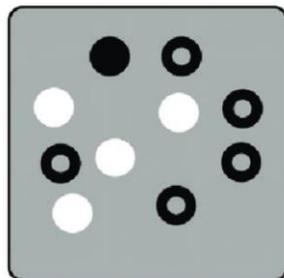
Improvements were assessed by examining response time (RT), error rates in VS, perimetric visual fields (VFs) and visual search fields (VSFs), before and after treatment. Functional improvements were measured using objective visual tasks which represented activities of daily living (ADL) and a subjective questionnaire.

Results: As a group the patients had significantly shorter mean RT in VS after training ($p < 0.001$) and demonstrated a variety of mechanisms to account for this. Improvements were confined to the training period and maintained at follow up. Three patients had significantly longer RT after training. They had high initial error rates which improved with training. Patients performed ADL tasks significantly faster after training and reported significant subjective improvements. There was no concomitant enlargement of the VF, but there was a small but significant enlargement of the VSF.

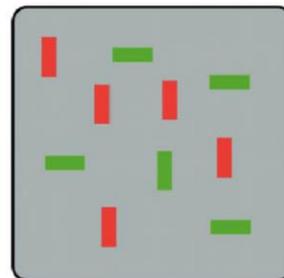
Conclusion: Patients can improve VS with practice. This usually involves shorter RTs, but occasionally a longer RT in a complex speed-accuracy trade-off. These changes translate to improved overall visual function, assessed objectively and subjectively, suggesting that they represent robust training effects. The underlying mechanism may involve the adoption of compensatory eye movement strategies.



Feature Search
(target present; black disk)



"Easy" Multiconjunction Search
(target present; black disk)



"Hard" Multiconjunction Search
(target present; green vertical bar)

Ocular Motility and Stroke

- Common symptoms: diplopia, oscillopsia, reading difficulty
- Strabismus has been found to occur in 16.5% of patients after stroke
- About 24% occur in the brainstem, cerebellar, thalamus or basal ganglia
- About 73% are cortical
- Only 36% complained of double vision

Orthoptic Assessment

About 19% of patients have manifest strabismus after cover/uncover test (~2.5% had prior history of strabismus)

Most common problem is an exotropia (CN VI, or loss convergence)

Left-sided neglect may partially explain lack of diplopia in right hemisphere strokes

Poor acuity +/-

Most patients improve over time, with little or no intervention

Management of Diplopia

Fresnel prisms

Occlusion

Orthoptic
exercises

Typoscopes

Compensatory
head postures

Orthoptist as key
part of stroke
rehabilitation

Driving



Know the Law

Iowa Legislature 761-
604.11(321) Vision Standards

VA:

- a) *Without Rx lenses --> 20/40 OD/OS, 20/50 OU; 20/50 OD/OS, 20/70 OU restricted*
- b) *With Rx lenses --> 20/40 OD/OS; 20/50 OU restricted headlights, 20/70 OU speed max 35 mph*
- c) *Other: if VA OS < 20/100 vehicle with left outside rearview mirror*

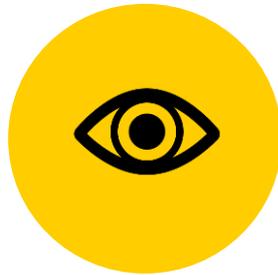
VF:

- a) *Binocular VF at least 140 degrees*
- b) *Binocular VF <140 degrees, but at least 115 degrees and OD/OS at least 70 degrees temporal and 45 degrees nasal -->restricted*

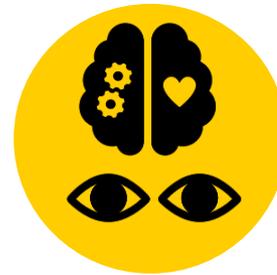
Take Home Points



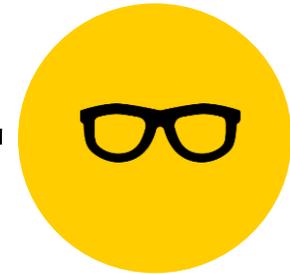
PT/OT:
Functionality
Fall prevention



Ophthalmology/Optometry:
Low Vision



Neuro-Ophthalmology:
Visual Fields



Orthoptist:
Prisms
Exercises

Additional Resources

- UIHC Low Vision Service – Dr. Mark Wilkinson:
 - <https://uihc.org/services/vision-rehabilitation-clinic>
 - Rehabilitation devices
 - Sighted Guide Technique
- UIHC Orthoptist Service
- Behind The Wheel Test:
 - <https://iowadot.gov/mvd/driverslicense/drivetests>
- Handicapped Parking Placard:
 - <https://medicine.uiowa.edu/eye/patient-care/clinics/vision-rehabilitation-and-counseling/about-handicap-parking-placards>
- Dark Window Exemption Guidelines:
 - <https://medicine.uiowa.edu/eye/dark-window-exemption-guidelines>
- IRIS: The Iowa Radio Reading Information Service for the Blind and Print Handicapped:
 - <https://iowaradioreading.org/>



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Visual Assessment & Interventions in Stroke

Questions?

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Iowa

Thank you

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