Updates on Neuro-ophthalmology: Optic nerve

14-SEP-2024, 15:15-15:30, The Islands Meeting
College Of Ophthalmologists of Sri Lanka
axel petzold
Expertisecentrum Neuro-ophthalmology Amsterdam UMC

Disclosures

NIHR UK, UCSF

Stichting MS Research NL

Novartis, Heidelberg Academy

Content

Optic Nerve Updates:

- Anatomical
- Imaging: AI for OCT & MRI
- Treatment

Optic Nerve Glymphatic System in rodents

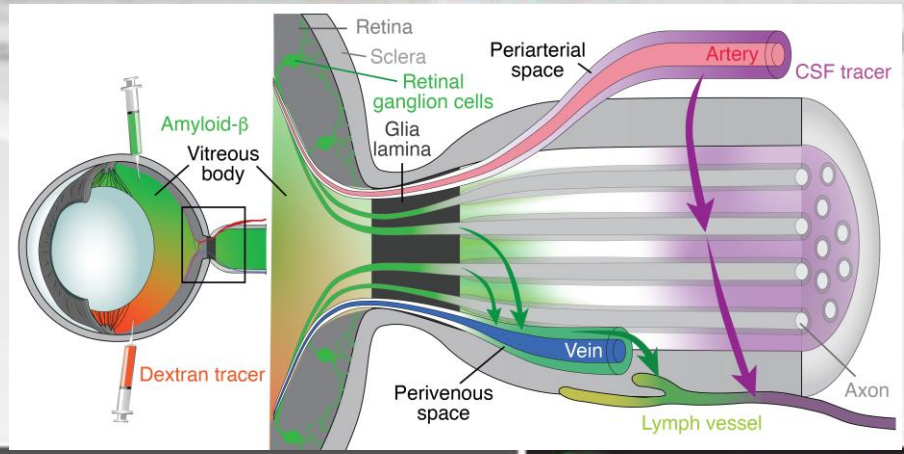
SCIENCE TRANSLATIONAL MEDICINE | RESEARCH ARTICLE

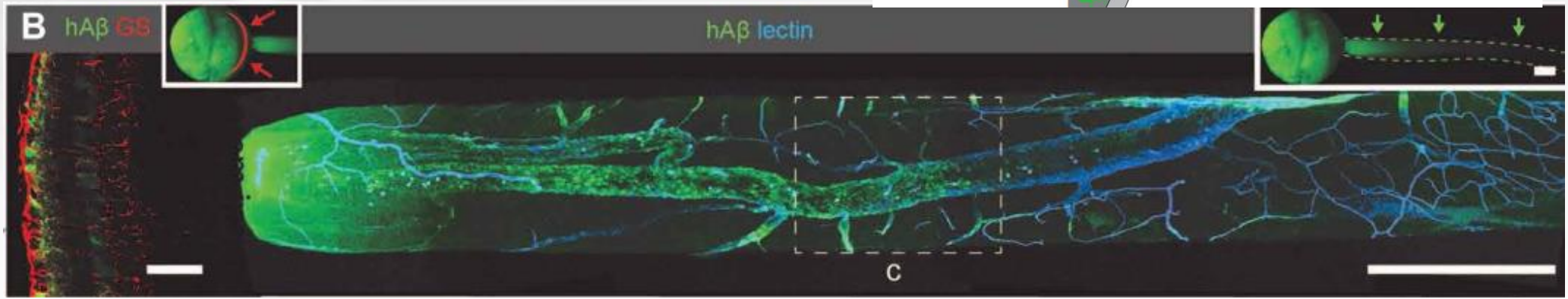
EYE PHYSIOLOGY

An ocular glymphatic clearance system removes β-amyloid from the rodent eye

Xiaowei Wang[1,2], Nanhong Lou[2], Allison Eberhardt[2], Yujia Yang[3], Peter Kusk[1], Qiwu Xu[2], Benjamin Förstera[4,5], Sisi Peng[2], Meng Shi[3], Antonio Ladrón-de-Guevara[2], Christine Delle[1], Björn Sigurdsson[1], Anna L. R. Xavier[1], Ali Ertürk[4,5], Richard T. Libby[6], Lu Chen[3]*, Alexander S. Thrane[1,7], Maiken Nedergaard[1,2]*

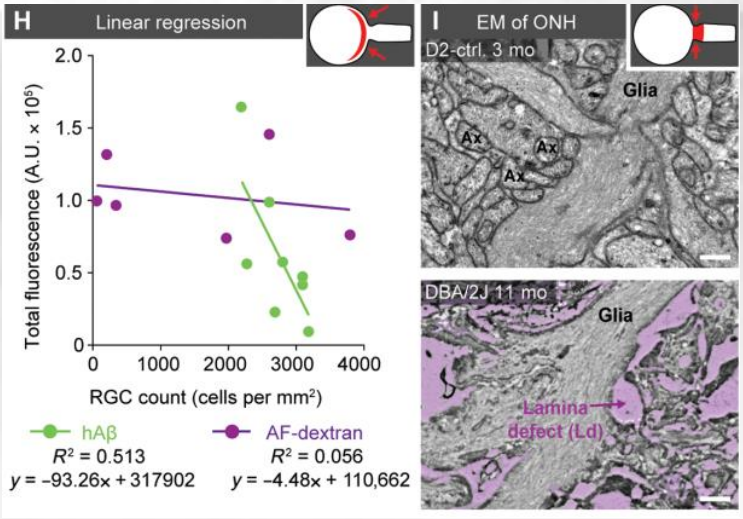
Despite high metabolic activity, the retina and optic nerve head lack traditional lymphatic drainage. We here identified an ocular glymphatic clearance route for fluid and wastes via the proximal optic nerve in rodents. β-amyloid





Wang, X. et al. Sci Translat Med 2020
Delle, C et al. Mol Sci 2024

Optic Nerve Glymphatic System in humans



Wang, X. et al. Sci Translat Med 2020

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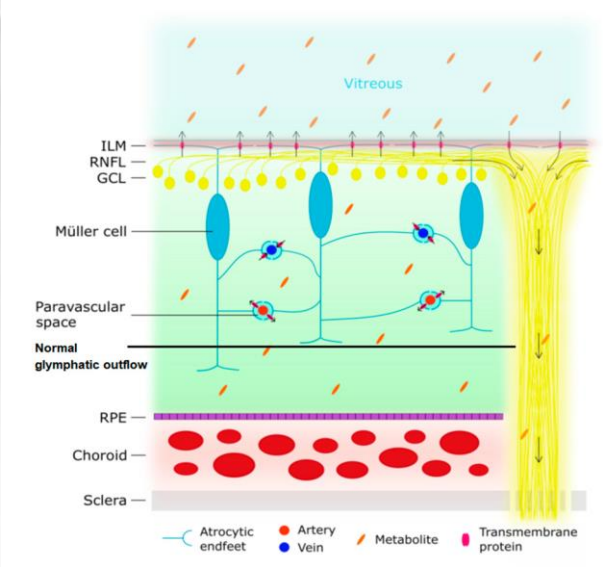
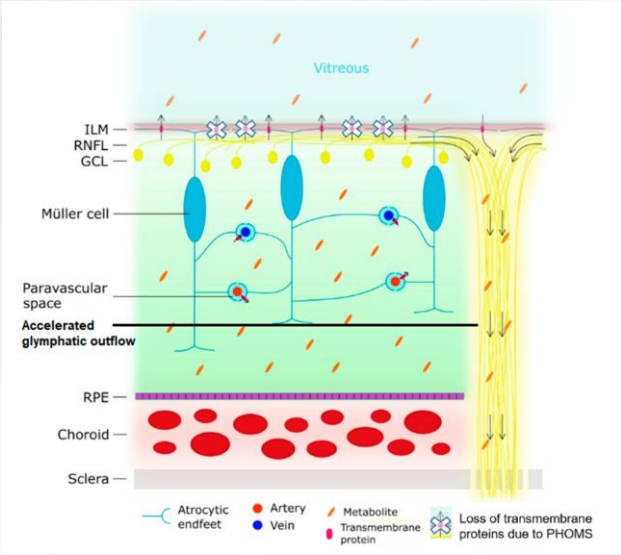


Optic atrophy



Kacar, S. et al. Brain Sciences 2023;14:36

Pioneering Sri Lankan Astronaut

NASA includes Sri Lankan in crew for simulated Mars journey

April 17, 2024

NASA has selected a new crew of four volunteers, including a Sri Lankan, to participate in a simulated mission to Mars within a habitat at the agency's Johnson Space Center in Houston.

Jason Lee, Stephanie Navarro, Shareef Al Romaithi, and Piyumi Wijesekara will step into the agency's Human Exploration Research Analog, or HERA, on Friday, May 10.

Life Sciences in Space Research 42 (2024) 40–46

Contents lists available at ScienceDirect

Life Sciences in Space Research

journal homepage: www.elsevier.com/locate/lssr

Review article

Imaging in spaceflight associated neuro-ocular syndrome (SANS): Current technology and future directions in modalities

Benjamin Soares [a,*], Joshua Ong [b], Ethan Waisberg [c], Prithul Sarker [d], Nasif Zaman [d], Alireza Tavakkoli [d], Andrew G. Lee [d,e,f,g,h,i,j,k,l,*]

Literature update: A new Journal
The optic nerve is in the 1st edition

Content

- Optic Nerve News:
  - Anatomical update
  - Imaging update: OCT & AI
  - Treatment update

OCT Diagnostic Criteria Update

Panel 1: **Diagnostic criteria for optic neuritis**

Clinical criteria

- A: Monocular, subacute loss of vision associated with orbital pain worsening on eye movements, reduced contrast and colour vision, and relative afferent pupillary deficit
- B: Painless with all other features of (A).
- C: Binocular loss of vision with all features of (A) or (B).

Paraclinical criteria

- OCT: Corresponding optic disc swelling acutely or an inter-eye difference in the mGCIPL of >4% or >4 µm or in the pRNFL of >5% or >5 µm within 3 months after onset.
- MRI: Contrast enhancement of the symptomatic optic nerve and sheaths acutely or an intrinsic signal (looking brighter) increase within 3 months.
- Biomarker: AQP4, MOG, or CRMP5 antibody seropositive, or intrathecal CSF IgG (oligoclonal bands).

Application of the clinical and paraclinical criteria

Definite optic neuritis

- (A) and one paraclinical test
- (B) and two paraclinical tests of different modality
- (C) and two different paraclinical tests of which one is MRI

Possible optic neuritis

- (A), (B), or (C) if seen acutely but in absence of paraclinical tests, with fundus examination typical for optic neuritis and consistent with the natural history during follow-up
- Positive paraclinical test or tests, with a medical history suggestive of optic neuritis

Multicenter Study > Neurol Neuroimmunol Neuroinflamm. 2024 Nov;11(6):e200291. doi: 10.1212/NXI.0000000000200291. Epub 2024 Sep 4.

Diagnostic Value of Inter-Eye Difference Metrics on OCT for Myelin Oligodendrocyte Glycoprotein Antibody-Associated Optic Neuritis

Giulio Volpe [1], Neringa Jurkute [1], Gabriela Girafa [1], Hanna G Zimmermann [1], Seyedamirhosein Motamedi [1], Charlotte Bereuter [1], Lekha Pandit [1], Anitha D'Cunha [1], Michael R Yeaman [1], Terry J Smith [1], Lawrence J Cook [1], Alexander U Brandt [1], Friedemann Paul [1], Axel Petzold [1], Frederike C Oertel [1]

> J Neurol Neurosurg Psychiatry. 2023 Jul;94(7):560-566. doi: 10.1136/jnnp-2022-330608. Epub 2023 Feb 21.

Diagnostic value of intereye difference metrics for optic neuritis in aquaporin-4 antibody seropositive neuromyelitis optica spectrum disorders

Frederike Cosima Oertel [1 2 3], Hanna G Zimmermann [1 2 4], Seyedamirhosein Motamedi [1 2], Claudia Chien [1 2], Orhan Aktas [5], Philipp Albrecht [5], Marius Ringelstein [5 6], Anitha Dcunha [7], Lekha Pandit [7], Elena H Martinez-Lapiscina [8], Bernardo Sanchez-Dalmau [8], Pablo Villoslada [8 9], Jacqueline Palace [10], Adriana Roca-Fernández [10], Maria Isabel Leite [10], Srilakshmi M Sharma [11], Letizia Leocani [12], Marco Pisa [12], Marta Radaelli [12], Marco Aurélio Lana-Peixoto [13], Mariana Andrade Fontenelle [13], Joachim Havla [14], Fereshteh Ashtari [15], Rahele Kafieh [16], Alireza Dehghani [17], Mohsen Pourazizi [17], Romain Marignier [18], Alvaro Cobo-Calvo [18 19], Nasrin Asgari [20 21], Anu Jacob [22 23], Saif Huda [22], Yang Mao-Draayer [24], Ari J Green [3], Rachel Kenney [25], Michael R Yeaman [26 27], Terry J Smith [28 29], Lawrence Cook [30], Alexander U Brandt [1 2 31], Friedemann Paul [# 32 2 33], Axel Petzold [# 34 35]

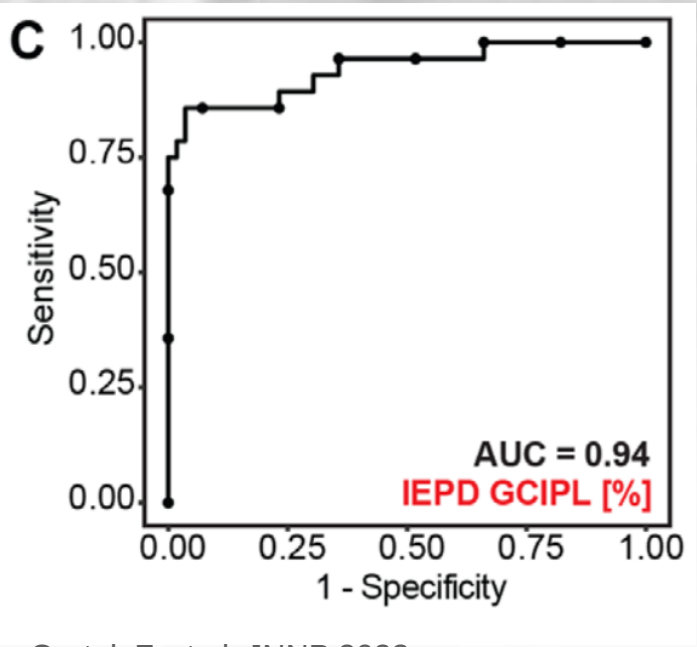
ICON study group TLN 2022

UCL

Expertisecentrum Neuro-ophthalmology Amsterdam UMC

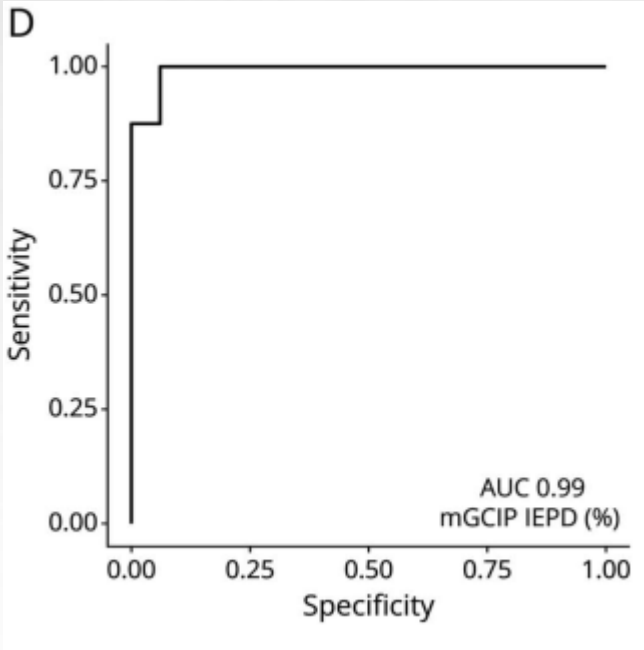
Excellent diagnostic accuracy of mGCIPL >4%

NMO-ON



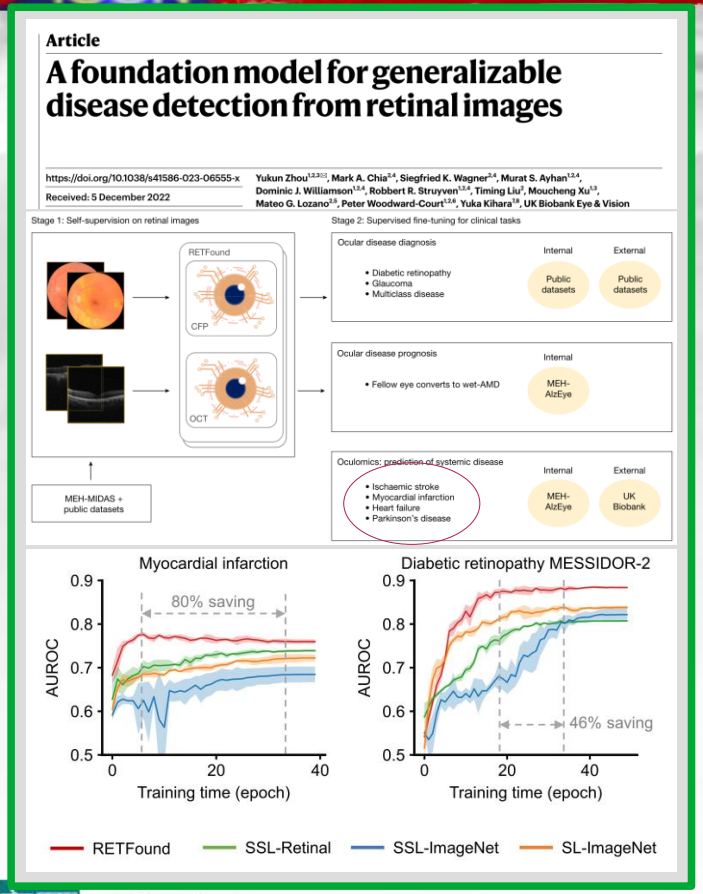
Oertel, F. et al. JNNP 2023

MOG-ON



Volpe, G. et al. Neurol Neuroimmunol Neuroinflamm 2024

AI Update



Article

A foundation model for generalizable disease detection from retinal images

https://doi.org/10.1038/s41586-023-06555-x
Received: 5 December 2022

Yukun Zhou[1,2,3✉], Mark A. Chia[2,4], Siegfried K. Wagner[2,4], Murat S. Ayhan[1,2,4], Dominic J. Williamson[1,2,4], Robbert R. Struyven[1,3,4], Timing Liu[3], Moucheng Xu[1,3], Mateo G. Lozano[2,3], Peter Woodward-Court[1,2,6], Yuka Kihara[1,8], UK Biobank Eye & Vision

nature medicine

Article

https://doi.org/10.1038/s41591-024-03139-8

Integrated image-based deep learning and language models for primary diabetes care

Received: 26 November 2023

Accepted: 18 June 2024

Published online: 19 July 2024

Check for updates

A list of authors and their affiliations appears at the end of the paper

Primary diabetes care and diabetic retinopathy (DR) screening persist as major public health challenges due to a shortage of trained primary care physicians (PCPs), particularly in low-resource settings. Here, to bridge the gaps, we developed an integrated image–language system (DeepDR-LLM), combining a large language model (LLM module) and image-based deep learning (DeepDR-Transformer), to provide individualized diabetes management recommendations to PCPs. In a retrospective evaluation, the LLM module demonstrated comparable performance to PCPs and endocrinology residents when tested in English and outperformed PCPs and

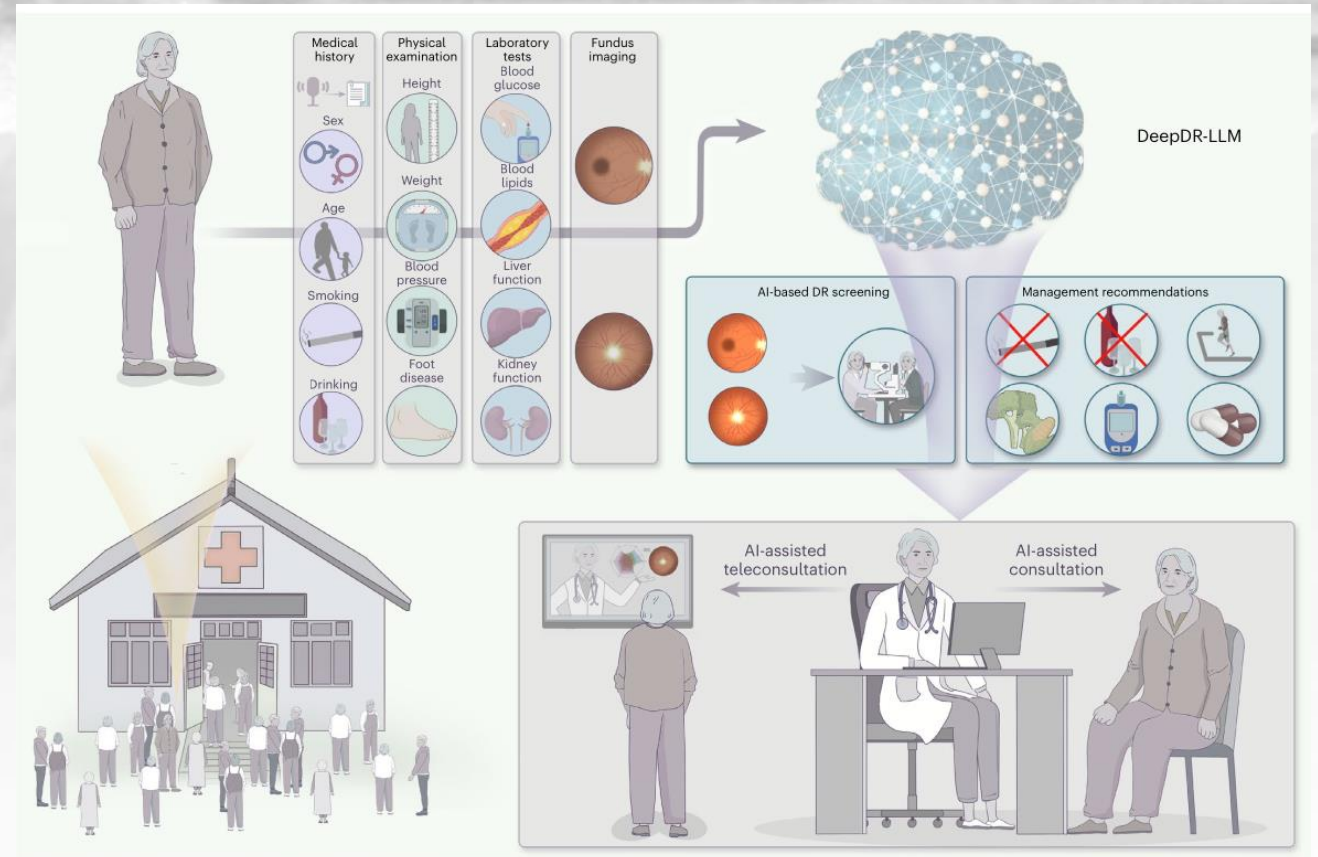
10.45 – 11.45 A.M. **DR. P. SIVASUBRAMANIUM ORATION**

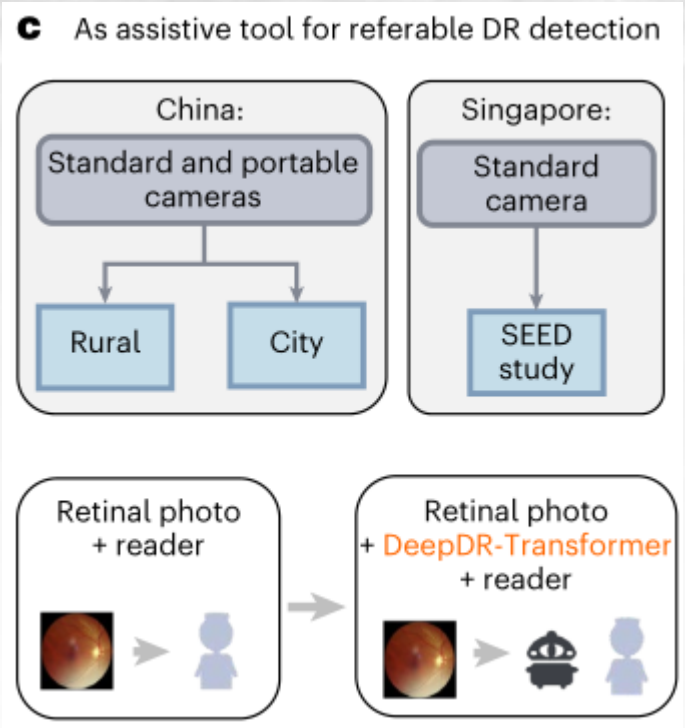
'EMERGING GLUCOSE METRICS & MEASURES OVER TWO DECADES OF RESEARCH IN DIABETES AND ITS IMPACT ON METABOLIC COMPLICATIONS'

Dr. Uditha Bulugahapitiya

MBBS (SL), MD (Col), MRCP (UK), FRCP (Edin) FACE (USA),
FCCP (SL), FSLCE (SL)
Consultant Endocrinologist
National Hospital of Sri Lanka

The future of patient care ?





Li, J. *et al* Nat Med 2024

Content

- Optic Nerve News:
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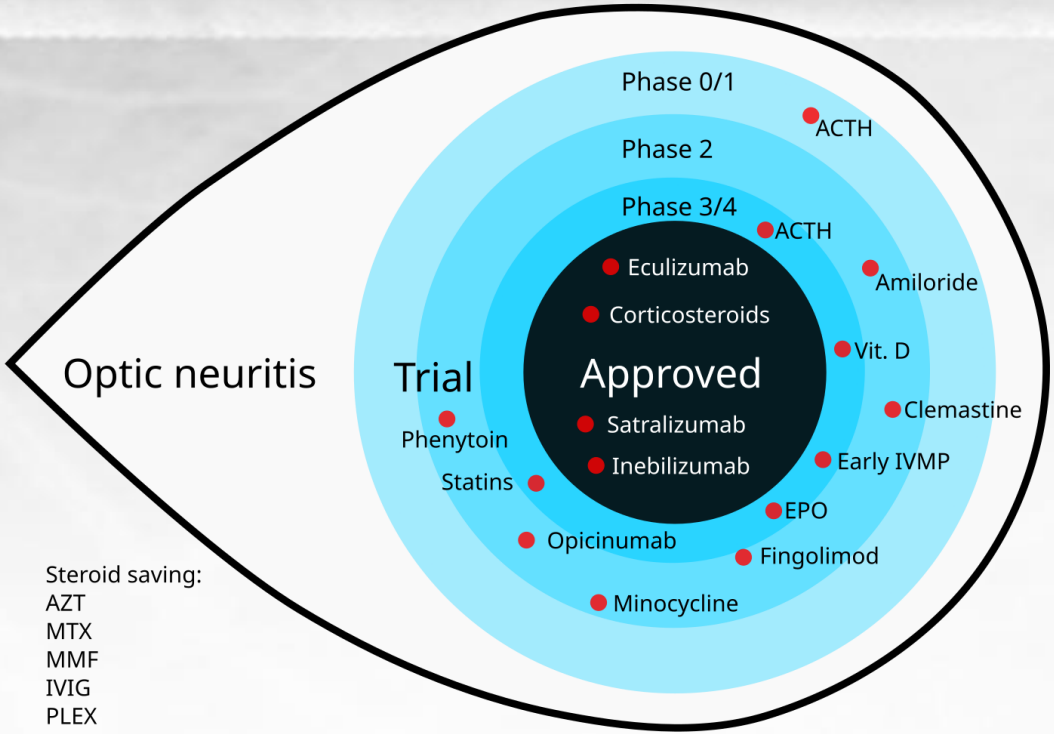
Update on Treatment



Steroid saving:
AZT
MTX
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Optic Nerve Repair = Remyelination

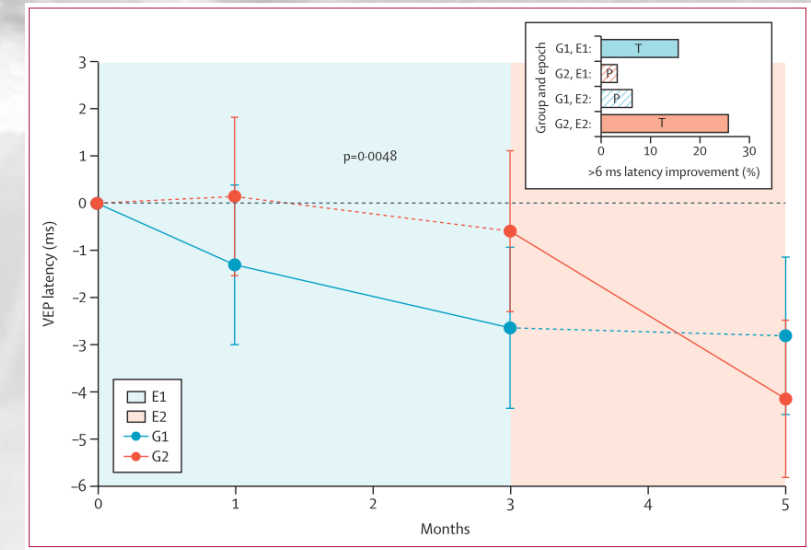
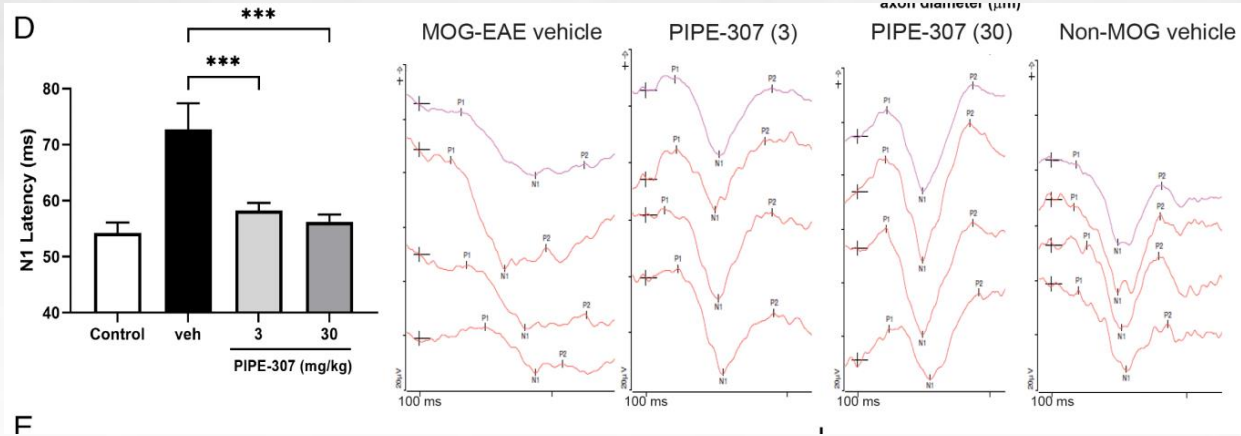


Figure 2: **Association of clemastine fumarate treatment with VEP latency delay in patients with chronic optic neuropathy**
Change from baseline in latency by group and epoch (model-derived estimates of means are represented by dots with the SE from baseline represented by error bars at each relevant timepoint). Solid line is on-treatment and dashed line is on-placebo. Blue line is group 1, orange line is group 2. Blue shaded area is epoch 1 and orange shaded area is epoch 2. p value is for primary analysis including crossover (with assumption of carryover). The inset is the percentage of patients with more than 6 ms improvement in latency delay. VEP=visual-evoked potential. G1=group 1. G2=group 2. E1=first epoch. E2=second epoch. T=treatment period. P=placebo period.

Green, AJ *et al* Lancet 2017

Is a VEP improvement of ~2 ms relevant? – Probagly not.

Is a VEP improvement of ~20 ms rewlevant? – Probably yes.



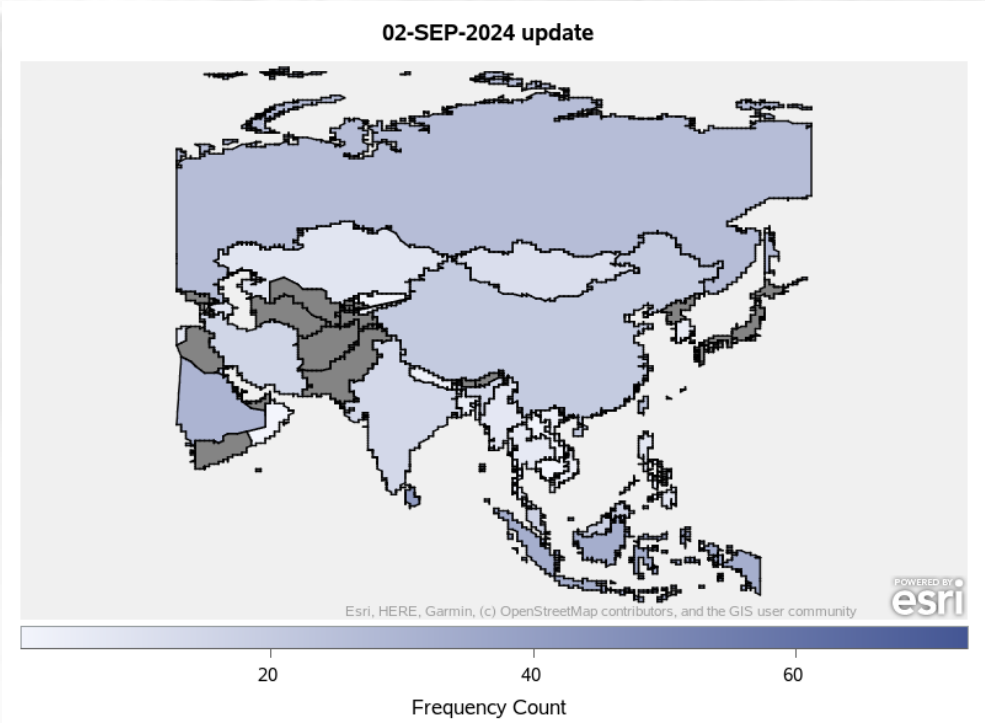
Poon, MM *et al* PNAS 2024

Conclusion – Optic Nerve Updates

- Anatomically: novel fluid transport systems (glymphatic) to be taken into account for interpretation of optic atrophy and OCT signal changes
- Imaging: excellent diagnostic performance of novel diagnostic criteria (ROC AUC > 0.99) in MOG-ON
- Treatment: a the dawn of new remyelination agents with a hope to heal

Thank you - Q&A

Please support the ICON survey
Co-authorship as part of the ICON study group name



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