SALUS UNIVERSITY
The Eye Institute

Pennsylvania College of Optometry
The Focal Point
May 2023 Edition

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Traditional Class of 2023

Hometown: Bath, Pennsylvania
Undergrad: Gettysburg College
Major: Health Science
Favorite Subject: Ocular Anatomy
Optometry Goal: Quality eyecare
Favorite food: Ravioli
Hobby: Baking chocolate chip cookies
Last Show I binged: Love is Blind

Chad Killen
Class of 2019, Pennsylvania College of Optometry

Hometown: Camden, DE
Undergrad: Gettysburg College
Major: Health Science, Minors - Bio and Chemistry
Optometry Goal: Practice long enough to see gene therapy bring back a patient's vision entirely
Favorite Food: Seafood & Sushi
Last Show I Binged: White Lotus

Case Title: Toxic Maculopathy or More? The Role of Genetic Testing in Patients with Maculopathy

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Some details of the case have been changed to protect patient confidentiality. Though the NBEO PAM-Style format is utilized for the case write-up, there is no affiliation with NBEO.

Demographics

60-year-old Black male; works as a security guard

Chief complaint: Decreased vision secondary to presumed toxic maculopathy OU

History of present illness

Character/signs/symptoms: difficulty seeing clearly at distance or near
Location: OU
Severity: moderate to severe
Nature of onset: gradual over the past 10 years
Duration: ~10 years
Frequency: constant
Exacerbations/remissions: none
Relationship to activity or function: medication switched from Plaquenil
Accompanying signs/symptoms: central scotoma

Patient ocular history

Bull's Eye Maculopathy secondary to prolonged Plaquenil use (Diagnosed in 2018)
Other Optic Atrophy (Diagnosed in 2018) secondary to bull's eye maculopathy OU
S/P Cataract Surgery (2017)
S/P YAG Capsulotomy (2018)

Family ocular history

Mother: no history of glaucoma or blindness
Father: no history of glaucoma or blindness

Patient medical history

Lupus (Diagnosed in 1985)
Type II Diabetes (Diagnosed in 2018)
Hypertension
Sleep Apnea
Heart Valve Disorder
Heart Disease
Anemia
Myocardial Infarction (2017)

Medications taken by patient

Metformin ER 500 mg
Atorvastatin 40 mg
Brilinta 90 mg
Duloxetine 60 mg, delayed release
Lantus Solostar U-100 Insulin 100 unit/mL
Metoprolol Succinate ER 25 mg, extended release
Methotrexate (unknown dosage)
Prednisone 20 mg
Omeprazole 40 mg

Patient allergy history

ACE Inhibitors (rash)

Family medical history

Mother: no reported history of diabetes, hypertension, or lupus
Father: no reported history of diabetes, hypertension, or lupus

Review of systems

Constitutional/general health: denies
Ear/nose/throat: Cardiovascular: denies
Pulmonary: Endocrine: denies
Dermatological: denies
Gastrointestinal: denies
Genitourinary: denies
Musculoskeletal: denies
Neurologic: denies
Psychiatric: denies
Immunologic: denies
Hematologic: denies

Mental status

Orientation: oriented to person, place, and time
Mood/Affect: normal

Clinical findings

Entering VA:

	Distance	Near
OD:	20/125	0.22/2.0M
OS:	20/50-2	0.22/2.0M

Pupils: PERRL (-) APD
EOMs: full, no restrictions, no diplopia
Confrontation fields: FTFC, central scotoma OU
Hirschberg: Symmetric

Subjective refraction:

	VA Distance	VA Near
OD: +1.00-2.25x075	20/125+	0.1/0.8M
OS: +0.25-1.25x075	20/50	0.1/0.8M
ADD: +10.00D		

Slit lamp:

lids/lashes/adnexa: good lid/globe congruity OU, clear lids/lashes OU
conjunctiva: pink & quiet palpebral conjunctiva OU, white & quiet bulbar conjunctiva OU
Cornea: diffuse PEE, clear stroma and endothelium OU
anterior chamber: deep and quiet OU
Iris: flat and intact, no NVI OU
lens: PC IOL in place, intact and clear PC OU
Vitreous: syneresis but otherwise quiet OU

IOPs/method: 10/9mmHg @ 12:41 PM measured with iCare
Fundus OD:

ONH: large nerves, distinct margins, no elevation, 1+ temporal pallor

C/D: 0.40/0.50
macula: circular depigmentation encircling foveal center with inferior pigment clumping ill-defined lesion, no CME
posterior pole: no diabetic retinopathy, normal course & caliber of vasculature
periphery: flat & intact, no breaks or detachments OU, no NVE

Fundus OS:

ONH: large nerves, distinct margins, no elevation, 1+ temporal pallor
C/D: 0.40/0.50
macula: circular depigmentation encircling foveal center with inferior pigment clumping ill-defined lesion, no CME
posterior pole: no diabetic retinopathy, normal course & caliber of vasculature
periphery: flat & intact, no breaks or detachments OU, no NVE

Blood pressure: 128/78 mmHg RAS at 1:04 PM

Case Images:

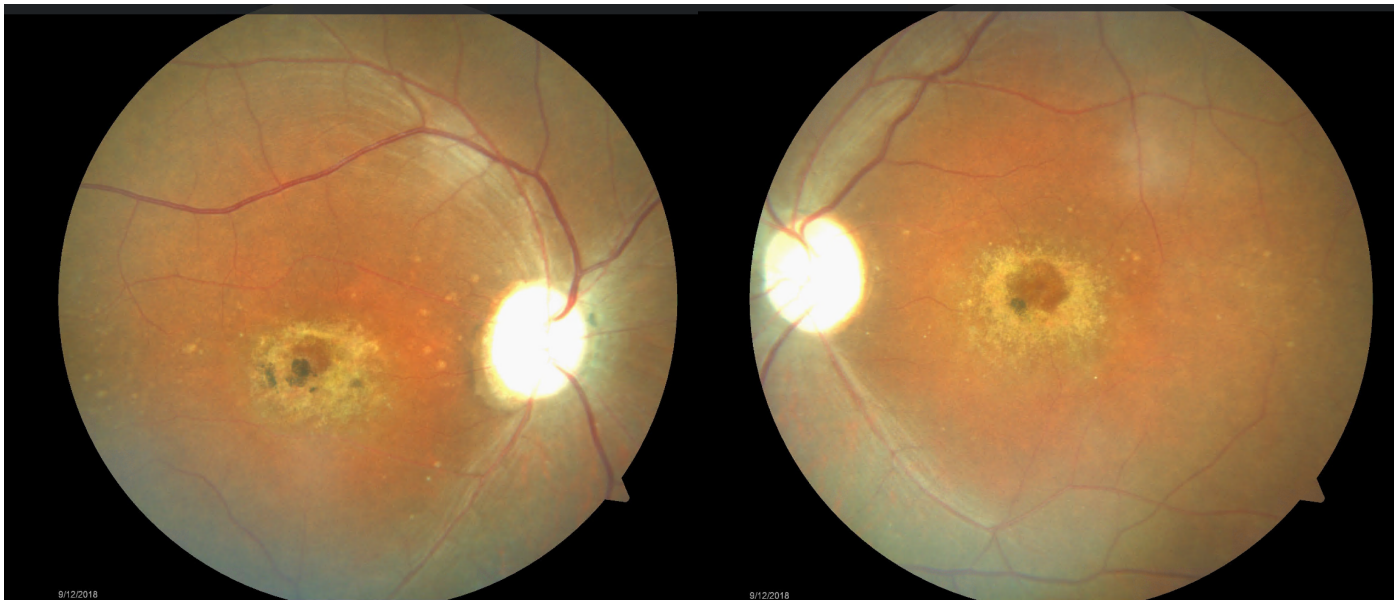


Image 1: Colored fundus photographs of right and left eye (respectively) showing hypopigmented circular pattern surrounding both maculae with pigment clumping central/inferior to maculae. Note the artifact present causing overexposure of the optic nerves.

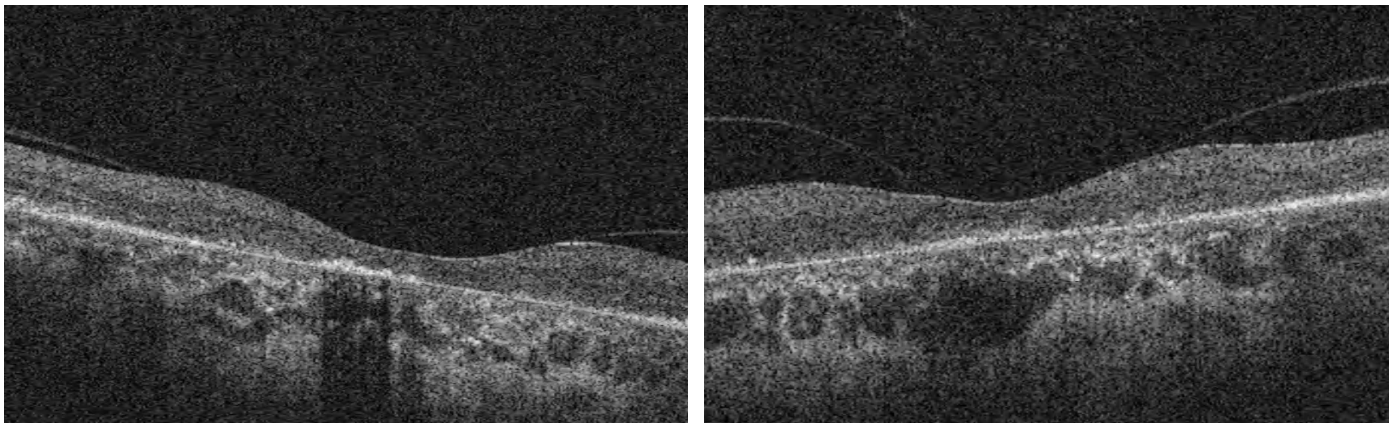


Image 2: OCT of right and left maculae (respectively) demonstrating thinning of outer retinal layers and RPE with RPE migration centrally.

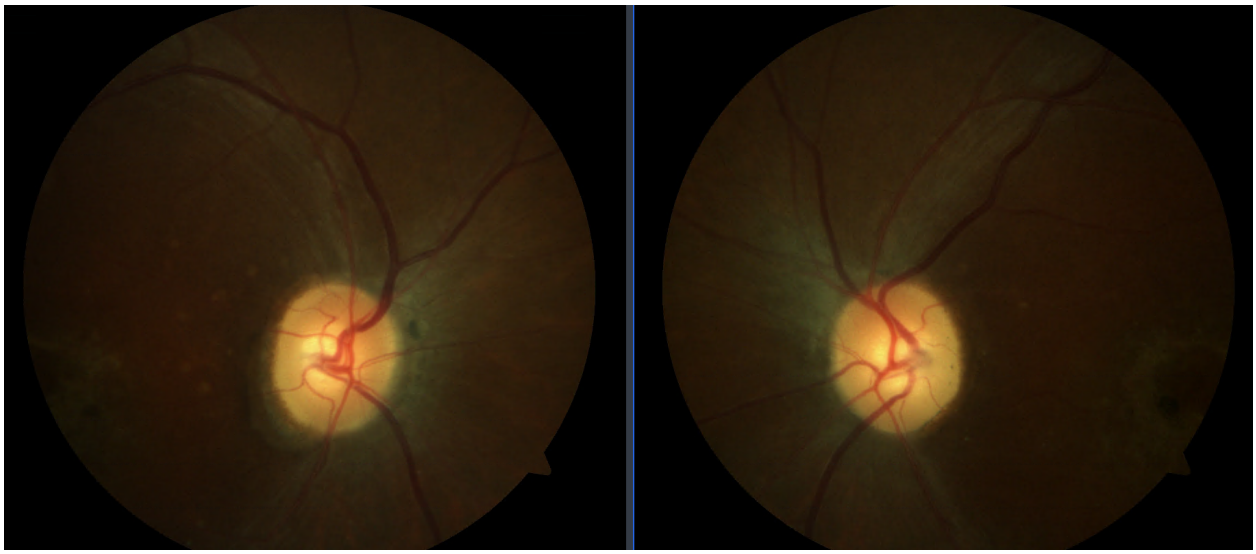


Image 3: Colored fundus photography of the right and left optic disc(respectively) from 2018 demonstrating 1+ temporal pallor secondary to bull's eye maculopathy.

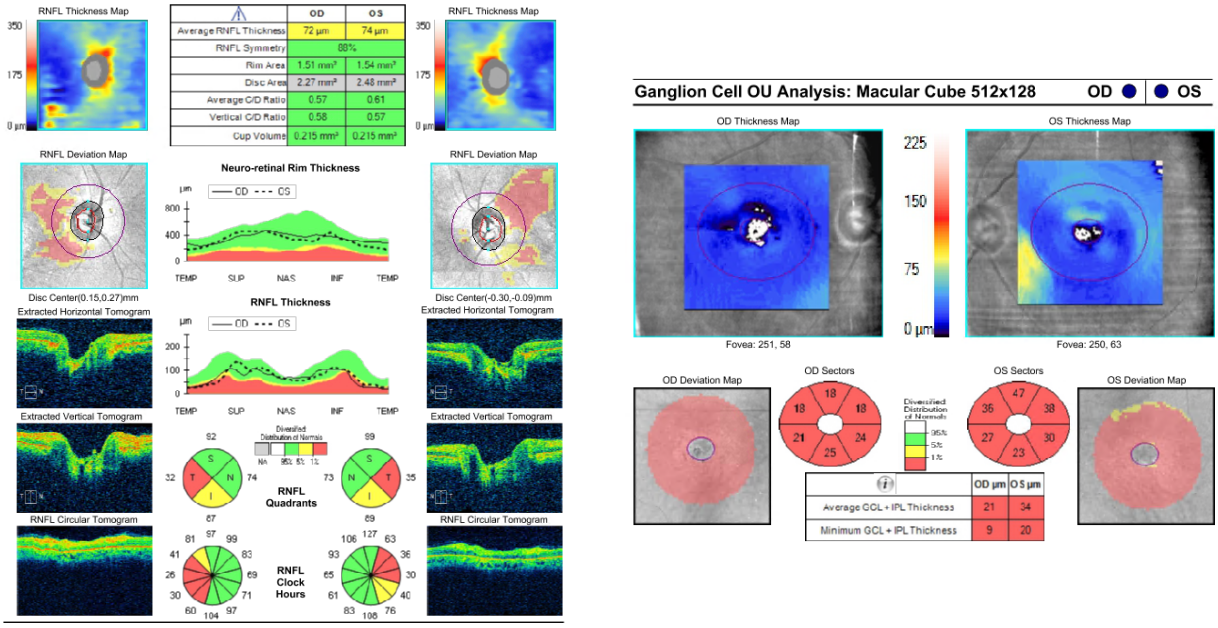


Image 4. OCT with ONH and RNFL Analysis and GCC Report demonstrating temporal and inferior RNFL thinning consistent with damage of papillomacular bundles due to bull's eye maculopathy OU.

Case Management Summary

The patient's case management can be broken down into ocular health and functional vision:

Toxic Maculopathy:

- Examination reveals stable visual acuity and structural testing indicating the toxic maculopathy has not progressed.
- We discussed continuing all medical care with his primary care physician and rheumatologist to monitor his diabetes, hypertension, and Lupus.
- The patient's macular appearance/OCT were not consistent with classic bull's eye maculopathy so we decided to run genetic testing looking for inherited retinal dystrophies - this revealed the patient is a carrier for a mutation in the ABCA4 gene associated with recessive cone-rod dystrophy, Stargardt's, and Retinitis Pigmentosa. In theory, as a carrier, the patient should not express the inherited retinal dystrophy.

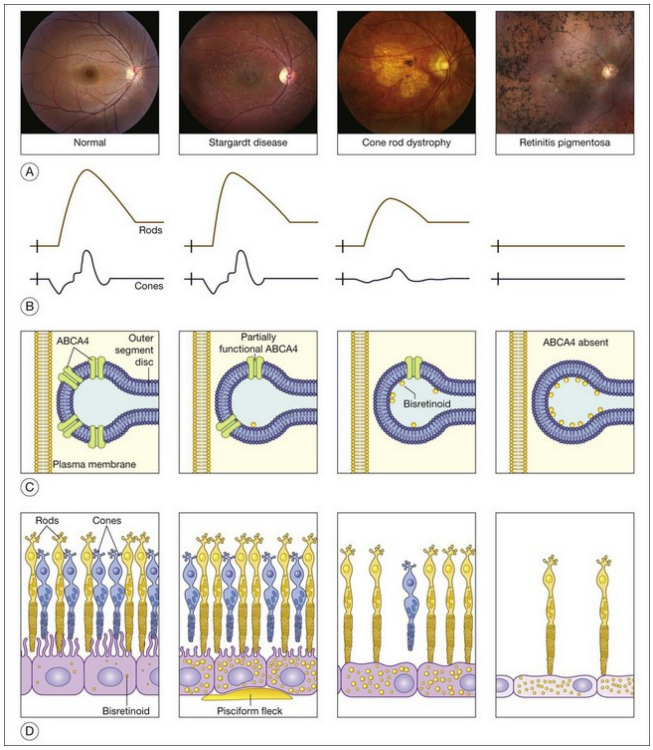
Category 1 Visual Impairment in One Eye:

- Patient's low vision goal is to improve his reading ability and see faces with greater detail
- For improved reading we showed the patient both +8D and +10D full field magnifiers as well as prism half eyes. Prism half eyes are high powered reading glasses that utilize base in prism to reduce the need for convergence. Due to cost issues the patient was gifted a +10D full field magnifier from our donated items.
- For seeing faces with greater details we decided to utilize a hand held telescope over the left eye (better seeing eye) and with a 2.75x telescope the patient was able to achieve 20/30 vision and was also gifted a donated telescope. While we would expect 20/20 vision with this device the patient has reduced contrast sensitivity and is just learning to use the device - we expect better acuity after further training.
- The patient uses a Windows computer while at work and we demonstrated the magnifier app with inverted colors for use while working.
- The patient was encouraged to return to low vision therapy for further training on the telescope to ensure that he would achieve the most success with the device in practical situations.

Case Pearls

- **There is nothing that says a patient can't have more than one diagnosis causing similar clinical findings.**
    - Patients can have comorbidities that cause similar clinical findings and our job is to ensure testing is performed to differentiate/understand the cause of clinical findings.
    - While not a textbook presentation for plaquenil maculopathy the patient has the medical history and was on Plaquenil for a length of time consistent with developing maculopathy.
    - Evidence has indicated that patients with ABCA4 mutations may be predisposed to develop retinal toxicity when exposed to hydroxychloroquine/chloroquine. However, the biochemical mechanism of the toxicity is unknown.
    - Further research is needed but it's important in patient education to explore all possible causes of our clinical findings and in corresponding with specialists like Rheumatology.
- **Low Vision requires an interdisciplinary approach to ensure that patients can properly utilize devices that they are prescribed**
    - Studies show that patients who attend low vision therapy report improved usefulness of their vision and utilize their devices with greater success.
    - Low vision is still an under-referred service and the general public is not often knowledgeable that this speciality exists. It is important for primary care optometrists to refer for low vision evaluations when indicated.
- **The ABCA4 gene is responsible for many inherited retinal dystrophies with various levels of vision loss/effect on functional vision**
    - ABCA4 is responsible for over 95% of Stargardt's cases as well as minor proportions of Retinitis Pigmentosa and Cone-Rod Dystrophy cases.

- Codes for ATP-binding cassette transporters that are expressed in the photoreceptors and are responsible for clearing by-products of the retinoid cycle.
- There are over 800 variants of ABCA4 mutations noted and you can have various phenotypes based on the specific genetic mutation.
- This image below shows the progression of decreasing amounts of ABCA4 function and the corresponding retinal appearance, ERG response, and the histologic effect.



Sheffield VC, Stone EM. Genomics and the eye. N Engl J Med 2011;364(20):1932–42.

- **Financial limitations can affect a patient's visual success**
  - Based on the patient's 20/50 acuity in the left eye he is not considered to be visually impaired based on the World Health Organization's classification of severity of visual impairment.
  - State agencies often utilize this to determine who is eligible for services. For example in Pennsylvania a patient must have 20/70 or worse vision in the better seeing eye (or severe visual field loss) to qualify for services. Our patient does not meet this requirement.
  - Low vision devices can be very expensive and without assistance some patients cannot afford to purchase the devices that can so drastically improve their functional vision.
  - It's important to know about opportunities to utilize grant's, state assistance, payment plans, non-profit organizations, etc that can offer support.