I. Case History:
- 49 year old black female
- No visual complaints reported, presents to clinic to update glasses
- No report of blurry vision, diplopia, or eye pain
- Patients’ medical history is significant for multiple sclerosis (MS) with Interferon Beta-1A treatment
- Past ocular history is remarkable for retrobulbar optic neuritis OU and optic atrophy OU

II. Pertinent findings:

Clinical findings:
- Best spectacle corrected distance visual acuity is 20/200 in each eye
- Extra-ocular motility findings are full range of motion in each eye with no pain on eye movement
- Pupils are equally round and reactive to light, without an afferent pupillary defect

Physical findings:
- Slit lamp biomicroscopy findings are unremarkable for all structures in both eyes.
- Intraocular pressures with Goldmann tonometry are 18 mmHg OU at 11:23am
- Dilated fundus examination is unremarkable for all structures, besides the optic nerve head, with cup-to-disc ratios of 0.50 round, with diffuse 1-2+ pallor OU

Laboratory studies:
- Basic metabolic panel is within normal except a recent high fasting glucose of 146mg/dL and a hemoglobin A1C of 6.3%

Radiology studies:
- Magnetic resonance imaging of the brain, with and without contrast, shows two findings consistent with multiple sclerosis: (1) multiple supratentorial white matter lesions due to chronic demyelination and (2) moderate-severe foci of increased signal change in the white matter. There is no evidence of acute demyelination.

Other studies:
- Spectralis® Spectral Domain Optical Coherence Tomography (SD-OCT) of the macula shows reliable images with nasal intraretinal cysts of the inner nuclear layer in both eyes.
- SD-OCT of the retinal nerve fiber layer shows reliable images with progression of nasal thinning OD and stable findings OS.
- 24-2 SITA standard visual field testing on the Humphrey Visual Field Analyzer shows infero-temporal defects OD and infero-nasal defects OS, and poor reliability, as there are multiple fixation losses, high false positive, and high false negatives OD and OS.

III. Differential diagnosis

Primary differential:
- Microcystic macular edema secondary to optic neuropathy in multiple sclerosis

Others:
• Diabetic macular edema
• Retinal vein occlusion associated macular edema
• Uveitis associated macular edema
• Central serous chorioretinopathy
• Neuromyelitis optica
• Age related macular degeneration

IV. Diagnosis and discussion:
• The patient is diagnosed with multiple sclerosis, a demyelinating disease that affects the central nervous system. The diagnosis is made by meeting the Revised McDonald Criteria which demonstrates dissemination of lesions in space and time, evidence of damage in at least two separate areas of the CNS, and evidence that damage occurs at two different points in time.
• Although multiple sclerosis can present with many ophthalmic manifestations, the majority of patients with multiple sclerosis have evidence of optic neuritis.
• Optic neuritis results in retrograde degeneration of the axons leading to retinal nerve fiber layer and ganglion cell layer atrophy and subsequent loss of macular volume.
• Cystoid macular edema has been cited in multiple sclerosis patients being treated with Fingolimod, a sphingosine-1-phosphate receptor.
• Recent studies have reported microcystic macular edema (MME) in a subset of MS patients not being systemically treated with Fingolimod.
• MME is detected by the presence of hypo-reflective spaces, confined to areas of nerve fiber loss, on SD-OCT. This microcystic macular edema does not affect the fovea, is primarily located in the INL, and has a characteristic perifoveal circle.
• Studies report a greater association of MME in patients with MS who had a history of optic neuritis compared to those with no previous history of optic neuritis.
• Interestingly, MME has also been observed in other eye disorders such as vascular occlusions, neuromyelitis optica, chronic relapsing inflammatory optic neuropathy, Leber’s hereditary optic neuropathy, autosomal dominant optic atrophy, and age related macular degeneration, among others.
• Many studies have shown an increased association of MME with optic neuropathy, irrespective of its etiology.
• In multiple sclerosis patients with a history of optic neuritis, it has been deduced that MME-presence may predict a higher relapse rate and a poorer visual outcome, than those without MME. Regardless of the etiology of MME, the presence of MME results in severe optic nerve fiber loss and a poor functional outcome.

V. Treatment, management:
• Treatment:
  o Coordinate care between optometry, neurology, and primary care physician.
  o Continue Interferon Beta-1A treatment by Neurology.
  o Patient is returning to the eye clinic in 3 months for 24-2 HVF
VI. Conclusion:

- Optic neuritis is a common finding in many patients that are diagnosed with multiple sclerosis.
- While MME is not a specific indicator of demyelinating disease, it is distinguishable from other forms of macular edema which are commonly the result of vascular leakage.
- MME has been observed in many disorders and its detection with SD-OCT may be a useful predictor of disease progression in patients with multiple sclerosis as its presence was associated with greater disease severity.
- Using the SD-OCT may also be useful for tracking MS patients over time as some studies have shown that thinning of the GCIP (ganglion cell + inner plexiform layer) relate to global neurodegeneration and brain atrophy in MS.
- The presence of MME in new patients warrants further examination and possible CNS imaging as its presence has been associated with neurodegenerative disorders and a poor functional outcome.