I. Case History

- **Patient demographics**: 63-year-old white male, retired university professor

- **Chief complaint**: Patient presented for an emergency visit with complaint of visual field constriction and rapidly decreasing visual acuity of the left eye. Patient’s wife reports that following the surgery he had aphasia and a significant visual field loss in both eyes, but the visual changes in the left eye started in the past 2-3 days and is rapidly worsening.

- **Ocular, medical history**: The patient was diagnosed with glioblastoma and had a left frontotemporal craniotomy for resection of the underlying GBM 8 months prior. He is currently 5 months post radiation therapy and receiving chemotherapy with temozolomide every 28 days.

- **Medications**: Lisinopril, Amlodipine, Temozolomide

II. Pertinent findings

- **Clinical**: Best-corrected VA was 20/20 OD and 20/30+2 OS.
  - **Confrontation fields**: constricted superior/temporal field OD and constricted superior field almost to central vision OS
  - **Ocular motilities**: full and smooth without pain or diplopia, patient notes that light disappears when he looks to the right
  - **Pupils**: PERRLA OD with good consensual response but no direct response OS and 2+ left RAPD.
  - Patient subjectively noticed that light is brighter with OD than OS (100% OD and 10% OS on Red cap test).
  - **Anterior segment**: by biomicroscopy was unremarkable.
  - **Posterior**: The optic nerve showed a cup-to-disc ratio of 0.30 OD, 0.35 OS with no edema OU and mild inferior atrophy concentrating inferior/temporal OS. The peripheral retina was flat and attached.

- **Physical**: patient has aphasia, elevated blood pressure

- **Laboratory studies**: negative ESR, CRP, and normal CBC with diff to rule out GCA

- **Radiology studies**: MRI scans focused on orbit and chiasm revealed abnormal signal on T2 in the optic chiasm and left pre-chiasmatic optic nerve indicating the most likely etiology is radiation induced optic neuropathy.

- **Others**: Original exam date: Humphrey Visual Field 24-2 SS showed temporal field loss, respecting vertical midline OD and overall depressed field concentrating on nasal and superior field OS. OCT RNFL scan was difficult to obtain due to patient’s inability to fixate well with OS but results showed no thinning in all quadrants OD and only thinning of superior temporal quadrant of OS.
• 1 week later: Best corrected visual acuity is now 20/20 OD and HM only inferiorly OS. HVF 10-2 SS revealed similar temporal field loss, respecting vertical midline OD and complete visual field loss with patient unable to detect any stimuli OS.

III. Differential diagnosis

Primary/leading: Compressive optic neuropathy
Others: Arteritic anterior ischemic optic neuropathy, Non-arteritic ischemic optic neuropathy, Optic neuritis

IV. Diagnosis and discussion

Elaborate on the condition: Radiation-induced optic neuropathy (RION) is a late complication of radiotherapy to the anterior visual pathway resulting in acute, profound, and irreversible vision loss. On examination, the patient may see nothing and the clinician may see nothing (posterior RION); the disc may appear swollen (anterior RION); or, the nerve may appear pale. A CT of the brain and orbit, with and without contrast, is typically noncontributory; but, a T1-weighted, gadolinium-enhanced MRI will show enhancement of the optic nerve. Attempts at treatment have included high-dose corticosteroids, anticoagulation, and hyperbaric oxygen, alone and in combination, but success has been dismal with an overall prognosis of 85% having a final visual acuity of 20/200 or worse.

Expound on unique features: RION occurs commonly between 10-20 months, with an average of 18 months after treatment; but the onset may range from three months to 9 years (Our patient is 5 months post radiation therapy). Many factors increase risk of development of RION including age, cumulative dose of 63Gy of radiation, pre-existing compression of the optic nerve and chiasm by tumor, concurrent chemotherapy or previous external beam radiation.

V. Treatment, management

Treatment and response to treatment:
• Although MRI competed 5 days prior showed no damage to optic nerves or chiasm and neurologist confirmed there was no damage to the optic nerves or chiasm from tumor or surgery; patient was referred to oncology/neurology for repeat MRI with focus on the orbits and chiasm.
• Patient was started on Dexamethasone 4mg po QID - progressive, worsening visual loss (20/30 to HM in 1 week).
• At the time of this report, the patient is currently receiving treatment with IV steroids and being monitored closely with his radiology oncologist and neurologist.
• Patient is to be seen back in our office in 2 weeks for repeat visual field, OCT, and eye health check to monitor for changes in the right eye.

Bibliography, literature review encouraged:
• Radiation-induced optic neuropathy by Helen V. Danesh-Meyer
  Academic Neuro-ophthalmology and Glaucoma, Department of Ophthalmology, University of Auckland, Auckland, 1142, New Zealand
• In search of a treatment for radiation-induced optic neuropathy by Maanasa Indaram, Ferhina S. Ali, Marc H. Levin
  Current Treatment Options in Neurology January 2015, 17:325
• Radiation-induced optic neuropathy following external beam radiation therapy for nasopharyngeal carcinoma: A retrospective case-control study by WEI WANG, HUI YANG, LING GUO, HONGYU SU, SHIHUI WEI and XIULAN ZHANG http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4840646/pdf/mco-04-05-0868.pdf

• Late-onset radiation-induced optic neuropathy after radiotherapy for nasopharyngeal carcinoma by Zhongyan Zhao, Yuqing Lan, Shoumin Bai, Jun Shen, Songhua Xiao, Ruiyan Lv, Bei Zhang, Enxiang Tao, Jun Liu. Journal of Clinical Neuroscience


• Radiation-induced optic neuropathy by Helen V. Danesh-Meyer. Journal of Clinical Neuroscience

• Ophthalmology doctors and the care of cancer patients: Optometrists can play a significant role in managing risk of ocular complications by Cheryl Guttman Krader in Optometry Times (March 01, 2010)

• Bilateral posterior RION after concomitant radiochemotherapy with temozolomide in a patient with glioblastoma multiforme: a case report by Stefanie SchreiberEmail author, Vanessa Prox-Vagedes, Erck Elolf, Ines Brueggemann, Guenther Gademann, Imke Galazky and Claudius Bartels. BMC Cancer201010:520. Published: 1 October 2010

VI. Conclusion

Clinical pearls, take away points if indicated:

• With new treatments and extended life span for many cancer patients, optometrists need to be aware of some of the delayed, yet potentially sight-threatening complications from cancer therapy.

• This case presents a rare case of optic neuropathy occurring even with low dose radiation (cumulative dose <60Gy) and concurrent chemotherapy. Even though the patient had difficulty describing his symptoms and had pre-existing visual loss due to brain cancer, it is still important to pay close attention when new visual symptoms do not correlate with previous history. Although the patient’s overall prognosis is poor, it is important as a member of his care team to alway be your patient’s advocate and try to preserve the quality of life of their remaining days.