

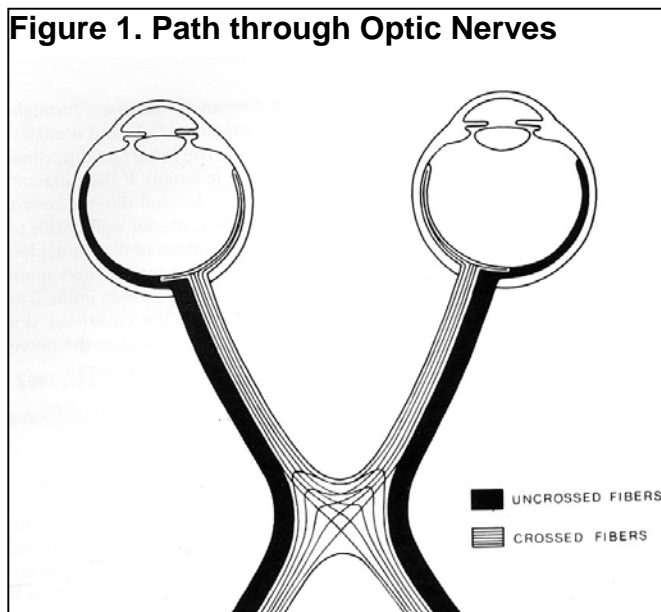
# What You Should Know About Radiation Retinopathy and Optic Neuropathy

*By David J. Browning, MD, PhD*

Certain diseases of the head, particularly cancer, require treatment with x-rays or protons to effect control or cure. Because of difficulties controlling exposure to radiation of the adjacent normal tissues, it may happen that the eye or optic nerve or both are damaged by the treatment. In this brochure we will discuss this unfortunate, but often expected side effect of radiation therapy.

## What are the Retina, Optic Nerve, and Optic Chiasm?

The lining of the back of the eye is a thin layer of nerve tissue called the retina. Light focused on the retina excites nerve signals that are passed via the optic nerve to the brain for further processing. Inside the skull, and just below the brain, the optic nerves cross in a structure called the optic chiasm. The fibers beginning in the side of the retina toward the nose of the left eye cross over to the right side of the brain, and the part beginning on the side toward the ear separate and travel to the left side of the brain. A similar, symmetric division of nerve fibers from the right eye occurs at the optic chiasm. Thus, the optic chiasm is a crossover point in the path of visual fibers to the brain. Figure 1 shows the retinas and how their fibers travel through the optic nerve through the optic chiasm to the brain.



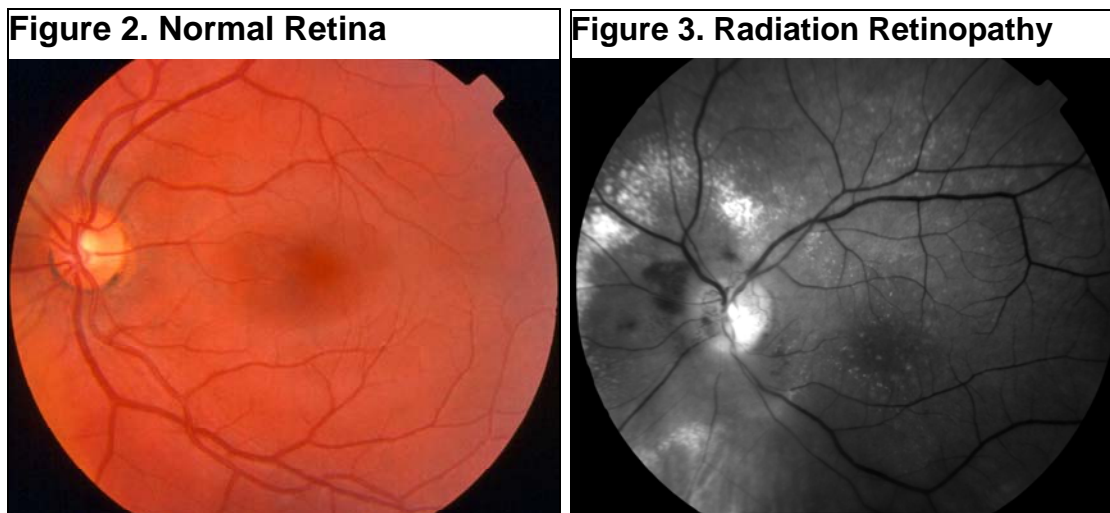
## Radiation Retinopathy

The most common example of a situation in which radiation retinopathy develops would be after a treatment of cancer of the eye, such as choroidal melanoma or retinoblastoma. Other examples would be treatment of cancers near the eye, such as cancer of

the nasopharynx or spinal cord. If the total dose of radiation exceeds 3000 centigray (a unit of radiation), radiation retinopathy may develop. Usually, radiation therapy is divided into fractions delivered in a series of treatments. If the size of the fractions exceeds 200 centigray, the chance of radiation retinopathy rises. Other factors that may increase the risk of radiation retinopathy include diabetes, hypertension, concomitant chemotherapy, pre-existing vascular disease, and increasing age.

### **What does the patient experience?**

Radiation retinopathy is painless and develops in most cases in a delayed fashion 6 months to 3 years after radiation treatment. Patients develop blurred vision from leakage or closure of retinal microvessels. Sometimes abnormal, fragile new vessels develop that can bleed, and this may cause the patient to see floaters in the field of vision. Figure 2 shows a normal, healthy retina. Figure 3 shows a retina with abnormal small vessels from radiation damage. In very advanced cases that are untreated, new vessels may grow and block the outflow path for aqueous humor to leave the eye, and the eye pressure may rise. This is called neovascular glaucoma, and may cause eye pain and nausea.



### **What is the treatment for Radiation Retinopathy?**

Sometimes an injection of medicine, such as triamcinolone or bevacizumab, is given in the eye to reduce leakage and new vessel

growth. Usually this would be followed with laser treatment to cause leakage to regress in a more sustained way, since the medications wear off in weeks to months. It is rare for vision to improve to normal, since capillary closure is not affected by these treatments, only leakage and bleeding. If severe bleeding inside the eye has occurred, an operation called vitrectomy may be necessary to clear the blood out and apply laser treatment. This is an outpatient procedure and is done under local anesthesia.

### **What is Radiation Optic Neuropathy?**

Just as the nerve tissue of the retina can be damaged by radiation, so can the optic nerve or optic chiasm. Again, the patient notices painless loss of vision. The ophthalmologist will see pallor of the nerve when he examines the eye. If diagnosed more than a few weeks after symptoms begin, there is no known effective treatment. If diagnosed within one or two days of onset, before the nerve becomes pale, occasionally hyperbaric oxygen treatments are administered over 2-3 weeks. Many times these fail to work, but rarely improvements have been reported, although relapse and progression to atrophy of the optic nerve can still occur.

### **Final Comments**

Radiation therapy for life threatening cancers sometimes causes unwanted damage to the sensitive neural tissues of the eye. There are steps to manage these side effects that have partial effectiveness.

If you have questions about this and other retina conditions, please feel free to e-mail Dr. Browning: [ask@theretinaexchange.com](mailto:ask@theretinaexchange.com). We also encourage the use of our website Forum, where patients can share their experiences with each other. If you would prefer to seek further information on your own, about this and other medical conditions, an excellent resource on the World Wide Web is the National Library of Medicine. This extensive website includes a search engine for numerous peer-reviewed medical journals and can be accessed at [www.pubmed.com](http://www.pubmed.com) or via the link provided at the bottom of our Information page.