

# VISUAL FIELDS

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One of the oldest uses to which visual field measurements have been put is the determinations of exact outlines of pathological areas in retina, and to locate lesions or abnormalities posterior to the retina in the visual pathway. To gain this information a complete understanding of the anatomy and physiology of the eye and nerve passageways to and from brain, must be acquired. Because of the length of the subject we will not go into it more than was attempted in the second lesson. A wealth of material is available in books already printed that pertain to this very thing.

Let us get it firmly established in our minds that the study of visual fields is the study of the projected fields. The corresponding retinal pattern will be backwards to the field. That is, the superior temporal quadrant in the field represents the inferior nasal quadrant of the retina, etc., nevertheless we record the field, not the retina. With this standardization established we can read any field and locate a lesion anatomically.

There are many pathological conditions of eye tissue itself that may create non-seeing spaces in the retina as a direct result. In a detached retina, for instance, where it has pulled away from the nutritive choroidal layer, the area of retina affected will lose the ability to change light energy into a nervous impulse for transmission to brain. To state it simply the detached area will be blind. Sometimes surgery can reattach the retina and restore vision. Of course, accurate visual fields showing the sections of the field involved and degree of visual loss in the area, is most important.

When this is found in routine practice the Optometrist can present a definite need to the Ophthalmic surgeon, and after his special work has been completed the patient is returned to finish the visual work that was begun. If the patient is simply told that he has a retinal detachment and that he will have to go elsewhere to have it cared for, the circumstances indicate a dismissal of the case. The patient feels he is merely shunted from one office to another, and he has not received the controlled care to which he is entitled after placing confidence in the man he first consulted. Here visual field charting helps give an adequate basis for professional cooperation to the patient's advantage, and maintains patient relationship with the Optometrists.

Where there is inflammation of the retina or choroid, without detachment, but fields are affected, we can read the fields, and the same relationship can exist with the Ophthalmic Physician as in the foregoing case. Visually affected areas can be charted before and after therapy and improvement noted. A record of the actual field will also tell if the condition is advancing.

Dr. Erich Pressburger, for fourteen years first assistant to Fuchs and teacher in Ophthalmology at Vienna says the following regarding choroidal-retinal inflammation affecting fields. "Blue and yellow are colors of the rods and cones. Red and green are colors of the nerve fibers. An attack in rods and cones affects blue while an attack in nerve fibers or the retina, or nerve pathways to the brain, affects red." From this we can locate the source causing relative scotoma. Doctor Pressburger further states as an example, "tobacco poisoning attacks nerve fibers posterior to the eyeball (retro-bulbar neuritis) and thus causes scotoma for red including the macular region and

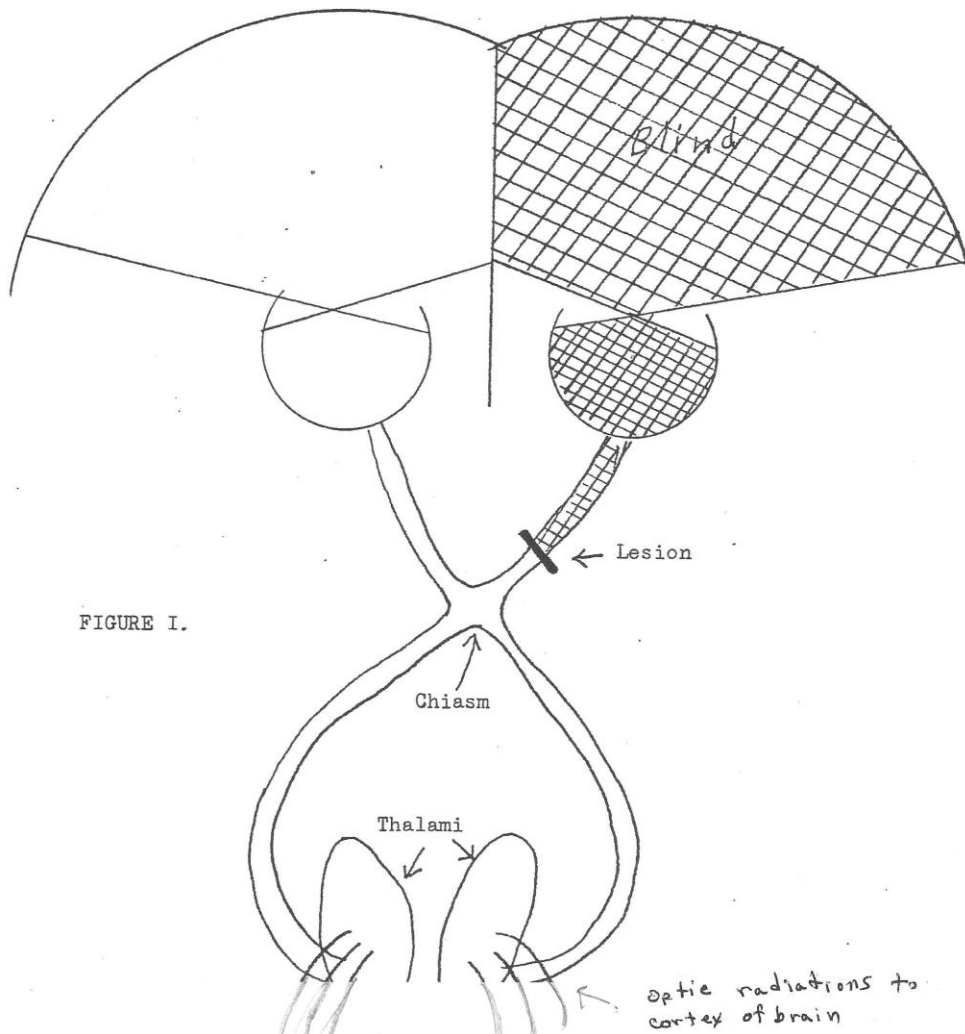
area between the macula and nerve head. Later there may be a scotoma for white in this same place. “

Most authors agree that if red is affected it indicates trouble in the retina itself, or nerve pathway. If blue is affected it indicated a choroidal disease affecting the rod and cone layer of the retina which lies adjacent to the choroid. Ralph I. Lloyd, in his Visual Field Studies, 1926, says “pure choroidal disease has no effect on the visual field, but usually the first sign that the disease is no longer confined to the choroid is a change in the visual field.” He also says, “choroidal and retinal disease affect \*\*\* blue first. Red and green are involved late. Nerve tract disease affects red and green first, and blue and yellow last.” (yellow is the compliment of red). If the defect is shown in both red and blue, and possibly white, it is old and very far advanced.

These fore stated conditions regard scotoma, and do not necessarily affect the peripheral limits of these colors.

### SECTOR DEFECTS AND HEMIANOPIAS

It is wholly possible that a retinal affection could be over such an area so as to cause a sector defect in the field. However the usual sector defects are due to lesions involving sensory nerve fibers supplying sectional portions of the retina. If the nerve is destroyed anterior to the chiasm it will produce blindness in one eye.



If the lesion is on the right side posterior to the chiasm it affects the temporal fibers of the right eye and nasal fibers of the left eye. Therefore the nasal half of the right field and temporal half of the left field will be blind.

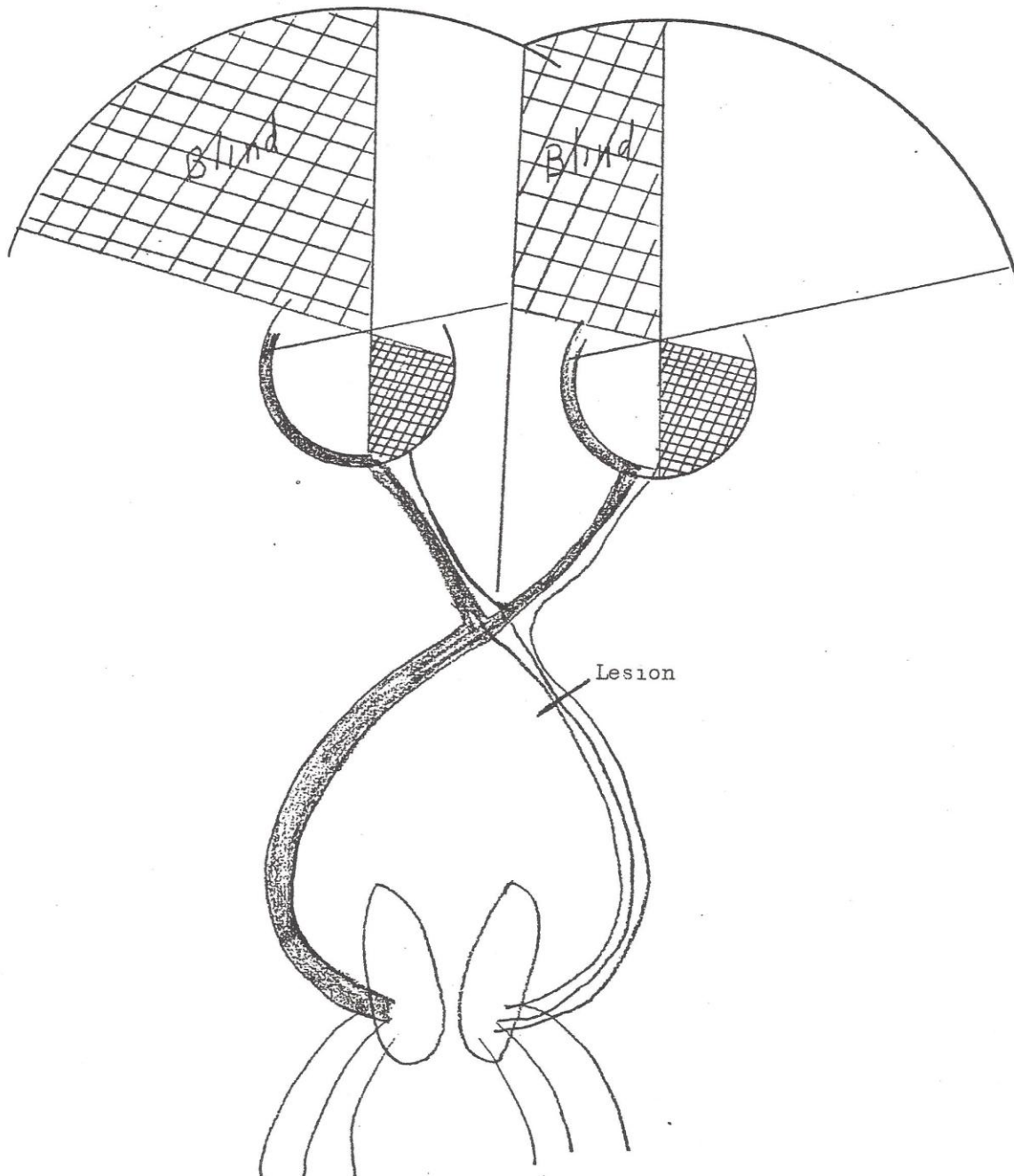


FIGURE 2.

A lesion at the chiasm usually affects the crossing fibers from both nasal halves of the retina. Thus vision will be lost temporally. Chiasmal lesions, however, may only affect one eye, and may even involve non-crossing fibers from one or both temporal halves.

Lesions along the optic tract are usually due to disease or pressure, but may also be due to trauma. Common sources of afflictions that attack in these brain regions are pituitary disease, brain tumors, syphilis including tabes, tuberculosis, multiple sclerosis, encephalitis, fracture, vascular disease (hemorrhage, etc). It is obvious from this group that lesions may occur anywhere along the tract and in a variety of manners.

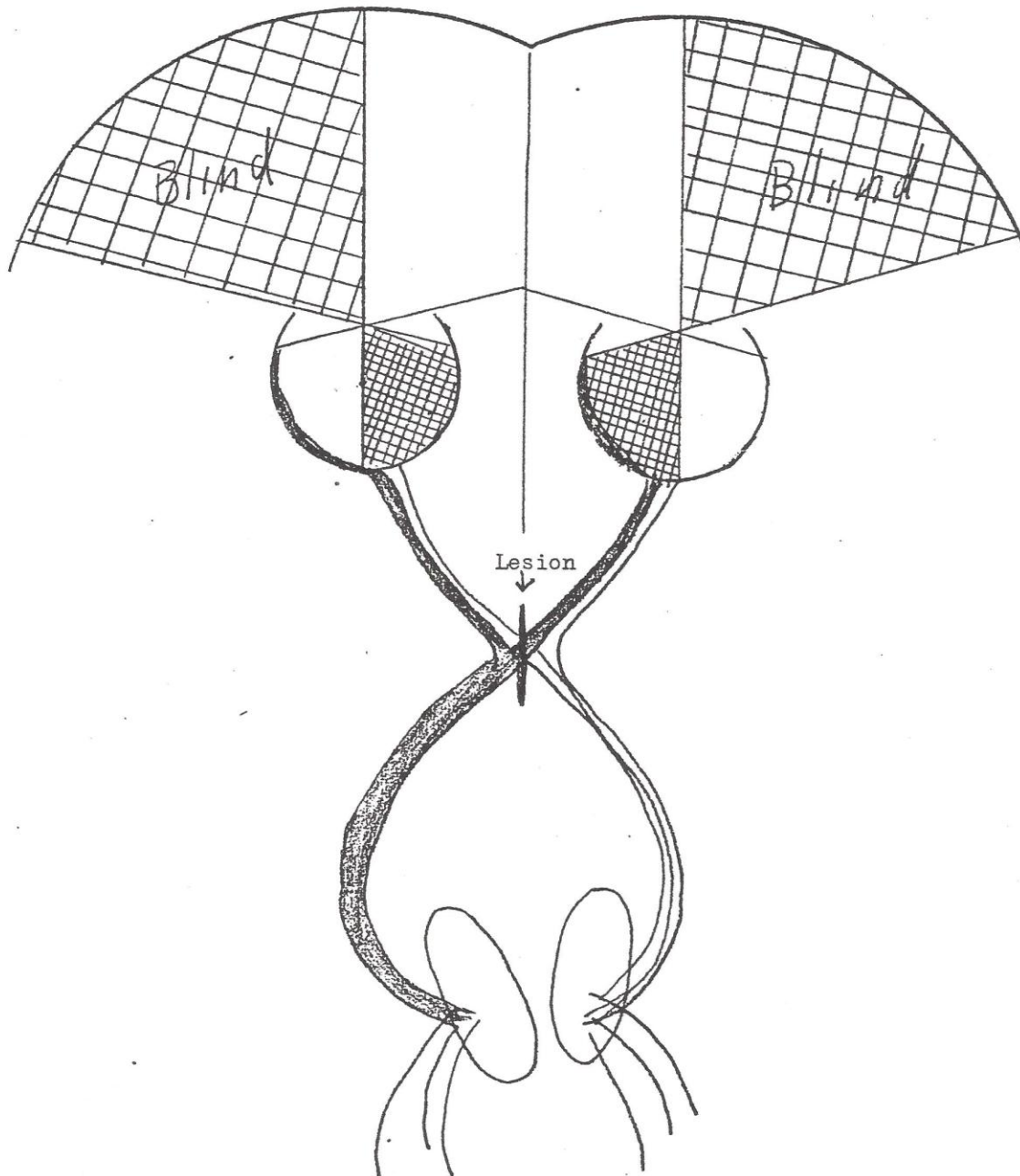


FIGURE 3

Among the most frequent are pituitary gland afflictions involving the chiasm which is located directly beneath it. As a diseased pituitary enlarges it creates pressure on surrounding tissue. Most frequently this pressure is directly downward and presses against the chiasm resulting in loss of temporal vision binocularly. (Figure 3). It is termed bi-temporal hemianopsia (hemianopia). In early stages macular vision and acuity are not affected. Reduction of the swelling will usually restore vision. It is nearly always dependent upon surgery to remove the enlarged portions.

Enlargement of the pituitary may take place downward and yet affect only the fibers from one side. Frequently it affects both nasal and temporal fibers in one eye and also the nasal fibers from the other. If the swelling breaks through the sella tursica (bony cavity in which the pituitary rests) and presses against the right tract of fibers from the right temporal retina and the left nasal retina then these areas will suffer loss of vision. The right nasal field will be blind as will the left temporal field. (Figure 2). This condition is called homonymous hemianopsia, and is distinguished by right or left according to which field suffers. Pressure may be against the fibers to inferior or superior portions of retina and thus superior portions of retina and thus superior or inferior fields will be blind. The term for this condition is altitudinal, or horizontal hemianopsia.

Defects do not necessarily cover a half of the field at once, and the affected region may be either totally blind, or merely relative. They may be extremely irregular, or, sectors of the field, like a piece of pie cut from the whole, may be blind. These may be in quadrants such as homonymous quadrant anopsia and bi-temporal quadrant anopsia, etc. Bi-nasal quadrant defects or even bi-temporal or irregular ones, may be from glaucomatous pressure inside the eyeball and not posterior to the bulb at all. In fact no field defect is in-and-of-itself a positive diagnosis for anything. It is only an indication of an abnormality at the time of the test that should be further investigated. Sector defects and hemianopsias should be referred to a brain surgeon without delay. The extent of development is extremely important if operative procedure is to be of any value. Not only are these conditions important for restoration of vision, but the saving of life itself.

People having lesions along the optic nerve and tract usually go to the Optometrist first due to visual impairment. When this is the cause of the visual disability letting it go unnoticed is a gross injustice to the patient.

## SUMMARY

To sum up our responsibility we can say that a patient cannot be dismissed if he exhibits a loss of visual ability in any portion of his normal field. These blind areas can be classed into two main categories, namely: isolated blind spots surrounded by useful areas of vision, called scotoma; and blind areas extending from the periphery centrally, called sector defects and hemianopsias. The most general causes are lesions from diseases and trauma, and pressures from growths and fractures. Regardless of the specific causes, surgery and/or medical treatment, are required before further visual therapy, per se, will be of great value. After the immediate danger is over from surgical operation, etc., visual training and lenses may be used as in other cases.