

VISUAL FIELDS

Copyright 1940



Duncan, Okla.

By

Hugh F. Webb, Opt. D.

With the Technical Assistance of T. A. Brombach, OPT. D.

March – 1941

Vol. 1 No. 6

No ocular disease is more intimately associated with visual fields than glaucoma. Its affection of the retina is so definite and its course of progression is so well understood that no case need go unnoticed in routine Optometric practice. The creation of blind areas in the field will usually occur before Ophthalmoscopic examination will reveal the classical excavation of the disc. Because ocular discomfort is a relative thing people will very frequently neglect the first symptoms of pain in glaucoma. It will be up to Optometrists to locate glaucomatous symptoms if the disease is to be discovered early. We need not reiterate the extreme advantages of early treatment. Fields give valuable information in the early stages. In the acute stage where its presence is obvious otherwise, fields are valueless.

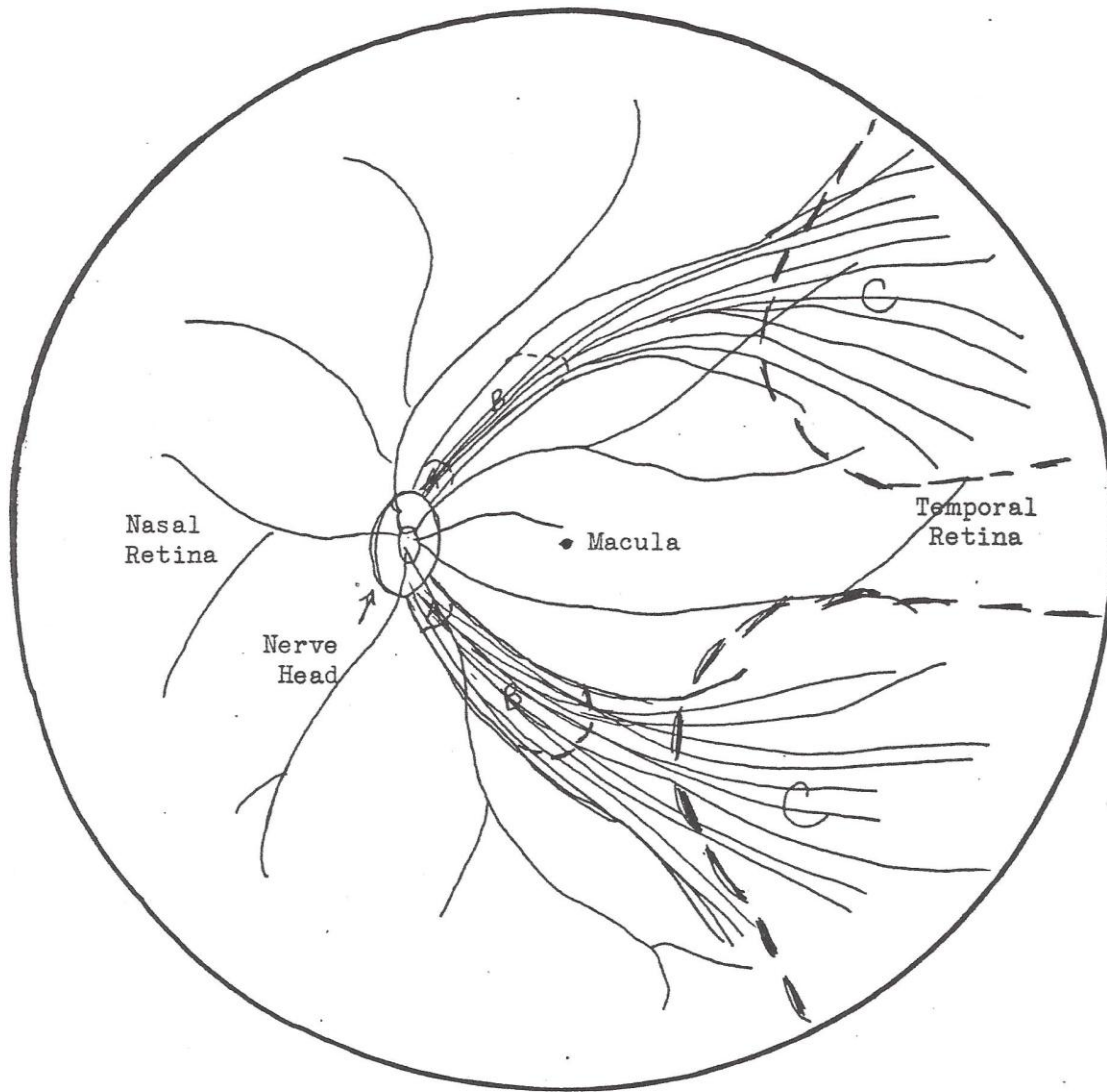
Glaucoma itself is a condition wherein glaucoma pressure is formed inside the eyeball greater than within the normal tension limits. It is thought to be caused by either a decreased ability in the drainage of the eye, or an increased secretion, or both. As a result the greater liquid volume causes a tension against the walls of the nerve fibers, blood vessels, etc. Sometimes the pressure even further hinders drainage. Some authors state that the increased pressure also decreases nutrition. The exact nature of the disease, and all its possible causes and effects, is not our problem here, but the mechanics of it gives light on how the visual fields are affected.

One of the first field signs of glaucoma is the enlargement of the physiologic blind spot, specifically from above and below. At first the enlargements will be finger-like projections from above and below Marriotte's blind spot curving around the macula. These projections have also been described as flame shaped. Seidel was the first to discover and proclaim this phenomenon and so it bears his name; Seidel's sign.

As the pressure and time of afflictions increases, the length of these blind areas increases. Bjerrum called this a sickle-shaped scotoma, and today it is called Bjerrum's sign. As the Bjerrum scotoma increases in length it encircles the macula and may even develop into a ring scotoma. This ring begins at the physiologic blind spot, and as it increases the concave side is always toward the macula. Occasionally we may find a curved defect not connected with the blind spot, but isolated. This, however, will be found to be in a curved line of direction with the blind spot and if the scotoma were continued it would run into it.

Referring to the first figure we can see the anatomical logic behind these phenomena. As the nerve enters the eyeball a bundle of fibers is extended from the upper border around the fixation point and scattering the individual nerves over the superior portion of the temporal retinal area.

FIGURE 1

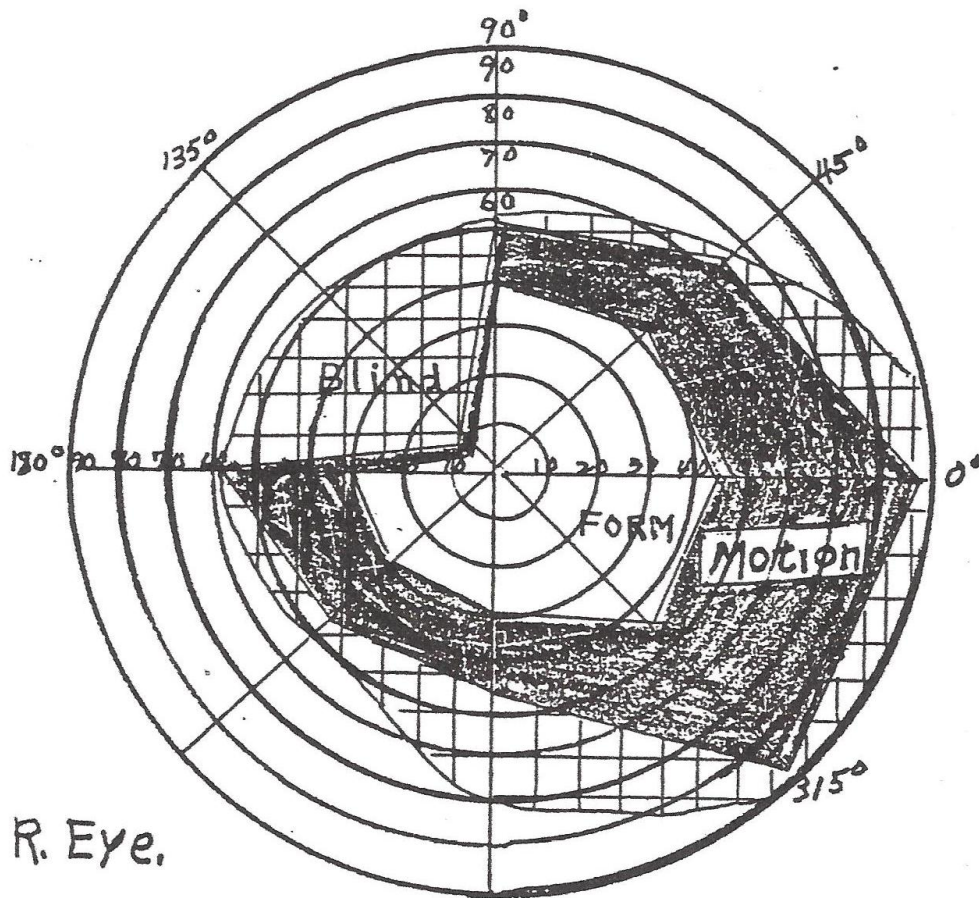


Showing the pathway of the bundles of fibers of sensory nerves from inferior and superior temporal quadrants. Glaucomatous pressure affects these bundles first.

A like bundle is distributed below the macular region to the inferior temporal retina. The pressure against the nerve head seems to affect one or both of these bundles before the other bundles. According to Lloyd the fibers going beyond the macula supplying the large temporal retina must travel farther and are greater in number, therefore there is a greater crowding of nerve fibers as they leave the nerve head. The greater crowding makes them more vulnerable to intra-ocular pressure. It would seem that this pressure would be more serious after the nerve head had begun to increase its cupping.

Another very common sign of glaucoma is a sector defect in the nasal field. Roenne named and described this phenomenon. It affects the peripheral limits of form and motion fields. Although it is not uncommon to find this defect as a temporal sector loss it is most generally in the superior or inferior nasal field. Lloyds explanation of the cause of Seidel's and Bjerrum's scotomas is also adequate for Roenne's step, because the areas usually lost in the step are supplied by the same fibers that are affected in Seidel's and Bjerrum's signs. Tracing these fibers has been done by retino-histologists and their work is readily verified in the clinical encountering of cases of opaque nerve fibers.

FIGURE II



TYPICAL ROENNE'S STEP

In the first diagram we see the course of the fibers from these particular bundles to the areas involved. In beginning stages areas "A" are first involved which characterizes Seidel's scotoma. Before the scotoma appears for white it may be relative, specifically for red as the pressure is affecting nerve fibers. Later we may find a scotoma for blue (affecting rods and cones) and

white. The same is true in Bjerrum's signs which is present when areas "B" are affected. Involvement of areas "C", the termination of these fibers, creates Roenne's nasal step. By the same logic any bundles of fibers, or any retinal sectors may be defective. Because the case is not typically alike to a schematic representation of the classical signs does not mean it should be neglected.

To chart Seidel's and Bjerrum's scotomas a flat screen must be used, or a campimeter. Varying sized targets will produce varying sized scotomas, especially if they are in the relative stage. Use the small targets described in lesson No. 4.

Routine perimetric charts will give indications toward Roenne's step. If there is an indication toward it more detailed study can be made on a tangent screen or on a perimeter if sixteen or more meridians are recorded.

There is the possibility of finding a suspicion only of the presence of glaucoma simplex, the chronic kind that comes on very slowly. No Ophthalmoscopic signs may be present and there may be no indication of an abnormal cupping of the disc. No sudden decreased in accommodative ability or lowering of acuity may be manifested. The indication may be a beginning Seidel's sign for red. If we watch the case and note that red also gives a Bjerrum's sign later, and possibly blue or white showing a Seidel's sign, then we have positive indications of a progressing intra-ocular pressure. Reference of this case to the Ophthalmologist for proper therapy will be extremely valuable in saving the patient's sight. If we should wait for an excavation of the disc (contrasted with normal central cupping), a steamy cornea, loss of acuity and what Traquair called "depression of the field," or a scotoma for white, "our case is in a bad way" as Lloyd puts it. These symptoms would mark a transition from the chronic non-inflammatory type to the acute inflammatory stage.

Perimetrically we are more interested in the chronic form than the latter stages. Visual field data obtained through measurements at regular intervals are valuable tests by which the amount of damage can be ascertained and the rate of progress watched. Common symptoms that indicate the need of careful field tests other than routine are failing vision (not myopia), excessive lachrymation, photophobia, recession of the near point in a short period of time, and pain and tenderness in the eyeball. In later stages where vision is greatly reduced not only are visual fields of little value but we frequently can't even get field measurements. Every case of glaucoma proceeds toward incurable blindness and even loss of the eyeball. Neglect of gaining information obtainable through visual fields is inexcusable, and a mark of haste and carelessness.

One more phenomenon has been observed more recently. It is not necessary that only on section of the retina be depressed as characterized by Roenne's step. Any or all quadrants may be depressed simultaneously. Lloyd recites cases of complete blindness in one eye and a hemianopic condition in the other which resembles very closely the fields of pituitary disease. Recent investigations through the San Francisco Polyclinic, and many private practitioners, shows a collapse of the form field (recognition of a 5 mm target while it is in a stationary position, not moving) in glaucoma, to inside the normal limits of Marriotte's blind spot. Indeed,

how can blind spot measurements be accurately made if such is the case. Also it is entirely possible to get a blind spot that looks like Seidel's or Bjerrum's signs when the real cause is something foreign producing a collapsed form field. Complete and careful tests, and analyses must be made when dealing with something so serious, and not take a haphazard guess.

SUMMARY

Glaucoma is a disease of the eye wherein there is an increased intra-ocular pressure. This intra-ocular tension causes portions of the retina to be no-receptive to certain stimuli. Usually the first affliction is a loss of vision for red in finger-like projections from above, or below the physiologic blind spot, or both. This is followed by an extension of the defective area around and toward the macula, and a gradual loss in the same area for blue, then white. Along with the latter there is exhibited a sector defect for white, usually in the nasal field. These three stages are known respectively as Seidel's and Bjerrum's signs and Roenne's step.

Visual fields are of extreme value in early stages of glaucoma to chart the progress of the disease. In the latter stages field studies are of little value. Early diagnosis is imperative for best results in saving vision.