A CLINIC RECORD REVIEW OF THE RELATIONSHIP OF AIDS PRESCRIBED TO THE INTEGRITY OF THE VISUAL FIELD

by

Thomas D. Snoeyink

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The Ferris State College of Optometry Low Vision Clinic has seen many low vision patients in its short history. In the last 3½ years a total of 289 patients were evaluated. In 1978, the initial year, 15 patients were examined; in 1979, 56 were examined; in 1980 there was 109 patients; and in the first half of 1981,104 were evaluated. The ages of these patients ranged from 3 years to 93 years old.

There are many aspects to low vision evaluation including visual acuity, refraction, visual field, effect of illumination, and the patients functional abilities. Initially, one would expect visual acuity to be the key to success in the low vision evaluation. However, visual acuity has both a subjective and objective aspect which must be taken into account before an evaluation. Visual acuity is a static test of visual function, it does not take into account the dynamic aspects of vision which makes static acuity relatively unimportant. In this clinical record study, I reviewed the files of 77 patients and I put my emphasis on the visual field of that patient and, therefore, what aids were prescribed. The patients were put into one of three categories: (1) patients with a central or paracentral scotoma, (2) patients with peripheral field loss and (3) patients with blurred vision but no field loss. I focused on the visual fields of these patients but one must keep in mind that the visual field examination cannot be isolated from the total evaluation of the total patient.

A visual field examination is a test of the visual acuity of the entire retina. It is a threshold measurement and there are many factors that help determine that measurement. Some of the

factors involved include: 1) physical characteristics of the stimulus, 2) background illumination, 3) retinal integrity, 4) refractive media, pupil size, and refractive errors, 5) patient attitude, 6) the perimetrists attitude and ability. If there is a loss in the visual field, we try to determine the location, shape and density of it. The etiology of the loss is less important than the integrity of the remaining field and it is the extent and location of the loss that is the determining factor.

The whole binocular field of vision extends 200 degrees laterally and 130 degrees vertically. The field is made up of: 1) the central field which makes up the field within 30 degrees of fixation and 2) the peripheral field which makes up the remainder of the field. Within these two areas, the normal field is determined by the acuity of all the various areas of the field.

There are many instruments for field testing. The instruments most commonly used by the students at Ferris to test within the central 30 degrees were the Amsler grid, Autoplot, and the tangent screen. The most commonly used instruments for testing the peripheral field were the Topcon bowl perimeter, and the projection arc perimeter.

There are two different methods of perimetry, static and kinetic. Static perimetry is more accurate than the kinetic method because the only variable is the luminance, but it is less flexible. Kinetic perimetry is more dependent on the knowledge and skill of the examiner, and patient cooperation. Kinetic perimetry also measures light sensitivity. The difference threshold is measured at many points just like static perimetry, but the method of measurement is by movement of the stimulus. When the perimeter is used for

kinetic perimetry the stimulus of constant luminance is moved from seeing to non-seeing, it, therefore, measures the various isopters of the field. These isopters are horizontal sections called 'islands of vision'. Kinetic perimetry is also called isopter perimetry. When the perimeter is used for static perimetry the stimulus is stationary and its luminance varies at different points along a specific meridian of the visual field. It then measures threshold luminance at each point and also sections through the field. This section is a vertical profile of the island of vision. Static perimetry is also called profile perimetry.

The farther the island of vision is from the macula, the poorer the acuity will be and the less likely that it can be used for reading. Below is a table of acuity zones listed in degrees from the point of fixation.[1]

Zone	Degrees from Fixation	Visual Acuity
Fovea	1-2½	20/20-20/40
Macula	2½-5	20/40-20/60
Paramacula	5-7½	20/60-20/80
Perimacula	7½-10	20/80-20/100
Optic Nerve	10-20	20/100-20/200
Margin of central field	20-30	20/400
Equator	30-60	8/200-4/200
Peripheral	60-80	3/200-1/200

Retinal degeneration or optic nerve diseases with central or paracentral defect is the most common cause of visual impairment. There are many pathological conditions which can cause a central or

[1] Eleanor E. Faye, Clinical Low Vision (Little, Brown and Company, 1976), p. 239.

paracentral scotoma. Here is a list of some of the diseases that can cause that type of loss: degenerative myopia, hypertension, vascular occlusion, macular degeneration, optic nerve inflammation and demylination, toxoplasmosis, histoplasmosis, lamellar hole, macular hole, Berlin's edema, thermal burns, drugs and many others. Approximately 75% of all low vision patients have diseaes involving the macular area.

The peripheral vision of an emmetrope is clear but without fine resolution. It is capable of gross vision and is therefore very useful for mobility and recognizing surroundings. The patient with a central or paracentral scotoma usually has an intact field around that area and can usually use a telescope to improve acuity for distance, but the location, shape and density of the scotoma will determine if that aid will be helpful. Patients with central or paracentral field defects can decrease the relative size of their scotoma by moving the object closer to their eye because as the image of the object increases the relative area of the scotoma decreases.

These patients can benefit from many aids, both optical and non-optical. One of the most important aids that can be presribed for them is a good spectacle, therefore a precise refraction must be done before any low vision aids can be tested. Dr. Faye and Drs. Mehr and Freid state that patients with a central or paracentral field loss should hold things close and most will require high illumination but care must be taken to reduce glare. Some patients bothered by glare are helped by use of a typoscope to increase the contrast. Many patients prefer to use large print

reading material without a high add because it enables them to use a normal reading distance. In decreasing order of frequency, the optical aids presribed at the[2] Lighthouse Low Vision Service for near tasks are: 1) spectacles 2) hand magnifiers 3) stand magnifiers 4) telescopic loupes and 5) closed-circuit televisions. For distant vision, patients preferred telescopes of 2.5x to 8x.

In my study, there was 37 patients with central or paracentral scotomas. Of these patients, 17 had macular degeneration, 14 had optic atrophy and 6 had multiple sclerosis with optic atrophy. The age of the patients with macular degeneration ranged from 19 to 77 years of age. The distance visual acuity of the patients with macular degeneration ranged from 20/50-3/700 and near acuity went from 20/50-20/800. I could find no direct relationship between acuity and the aid prescribed for these 17 patients. I feel that the patients age, attitude and task requirements were the determining factors with acuity not having a marked effect. These 17 patients were prescribed 55 optical and non-optical aids. Twelve of these patients benefitted from an increase in illumination. (The table at the end of this report lists the aids that were presribed).

The patients with a central loss due to optic atrophy had an age range of 16- 85 years old. The distance acuity ranged from 20/40-10/300, and the near acuity range was 20/30- 10/200, and again there was no correlation between acuity and the aid prescribed. There were 57 optical and non-optical aids prescribed for these 20 patients. Of the 57, 22 were telescopes with and without reading caps, and 17 expressed a sensitivity to light and were relieved with NoIR glasses or sunglasses.

The patient with a central or paracentral field loss usually has an intact peripheral field so mobility is not a problem and

by the use of telescopes distance vision can be improved significantly. As noted on the tables, many patients use multiple aids for use in various tasks. The ratio of aids, both optical and non-optical, to patients was slightly greater than 3 to 1.

Patients with a peripheral field loss have the most difficulty of all patients with field losses. Magnification of the image to the peripheral retina may not have the same beneficial effect that it does to a patient with a central loss. Most peripheral field defects are areas of depression rather than absolute scotomas. The peripheral field defects may be a variety of defects such as sector, segment or hemianopic loss. A peripheral field loss may be related to medical problems besides retinitis pigmentosa such as vascular disease, neurological disease and drugs. Some typical diseases that cause this type of loss are: retinitis pigmentosa, glaucoma, proliferative diabetes, retinal detachments, retinal tumors, head trauma, vascular occlusion, laser burns and many more.

The patient with only central acuity learns to look ahead while traveling because he sees a larger field the farther away he looks. He has trouble when he holds things close to his eye. A patient with normal acuity and a small reading field may be able to read but it will be at a slower than normal pace. If the acuity decreases causing a need for magnification, tha area of vision is inversely proportional to the magnification, therefore the field will shrink even more. Many patients with just central vision left don't appreciate the telescopic magnification for full time wear because the telescope enlarges the details in proportion to the remaining field. The fine details then are almost useless without peripheral

clues, so many patients prefer to keep their environment in perspective. If the patient reports that the letters seen in the peripheral retina get larger but not clearer with increasing magnification, it generally implies that the patients field is only going to be useful for mobility.

Patients with peripheral field losses but good central acuity may only need spectacles, but if the central acuity is decreased some form of magnification will probably be required. These patients normally reject high adds and telescopic loupes because of the small reading field. The aid of choice for these patients should make use of the field farther from the eye, therefore, they generally like the versatility of hand magnifiers and stand magnifiers. Many patients with small central fields like to use the closed-circuit television with a zoom lens. It allows them to use various reading distances, move the reading material so that they don't have to scan and they can make use of the reverse polarity feature to decrease retinal fatigue. Retinitis pigmentosa patients and other patients with pigment degenerations who see poorly in dim light usually benefit from NoIR glasses of amber(14%) and green (19%). Retinitis pigmentosa patients often develppe posterior subcapsular cataracts which decrease acuity to the point where no optical aids are helpful. Removal of the cataracts does not change the field of the patient but the spectacles prescribed after cataract extraction can decrease the field significantly, therefore, contact lenses or intraocular implants should be used. Some retinitis pigmentosa patients may benefit from using a Galilean telescope in reverse to get a larger field but the minification often then becomes the limiting factor. Other patients may be helped by using Fresnel Press-On

prisms of 10-15 prism diopters. Older patients who have had their condition for many years are so adept at scanning that they don't adjust to the prisms. Young patients usually have greater success with this type of aid.

In my study of 8 patients at Ferris who had peripheral field losses, 4 patients had retinitis pigmentosa, 3 had diabetic retinopathy and one patient had glaucoma. The distance acuity ranges of the patients with retinitis pigmentosa was 20/60-20/400; the near acuity range was 20/50-20/200. The range of acuities for the diabetic patients was 20/30-light perception. Two of the three diabetic patients were not presribed aids due to lack of motivation. Many of the patients with proliferative diabetic retinopathy have a poor prognosis for success with low vision aids due to the instability of the disease and, therefore, the continual fluctuations in acuity and the fields. (See tables for aids prescribed).

The third category into which I have divided patients is diseases which yield blurred vision without a field loss. The most common cause of blurred is a subnormal condition which affects the refracting elements of the eye. The retina is not usually involved in this type of impairment. A patient with refractive media opacities and scars will have more reading and mobility problems than a patient with the same acuity who has a retinal problem. A major problem for patients with media defects is a lack of contrast. Lighting may be fluorescent, incandescent or both. The patient must experiment with the best source of lighting and to reduce glare a typoscope or tinted lenses may help. Some of the typical conditions that cause blurred vision without a field defect are:

corneal scarring or dystrophy, keratoconus, bullous keratopathy, cataracts, vitreal detachments and hemorrhages, achromatopsia, diabetes, albinism, nystagmus, and early macular degeneration.

Patients with corneal anomalies may have decreased distance acuity without a significant decrease in their near acuity. If the corneal surface is irregular, contact lenses are recommended along with high adds. Cataracts are the most common cause of blurred vision. Their interference depends on the location, size and density. Posterior polar cataracts are close to the nodal point of the eye and can cause a significant vision loss. When nuclear sclerosing occurs, there is a fluorescent haze that occurs in the lens, therefore, most patients use incandescent lighting ang a typoscope. For reading these patients generally prefer high adds, hand magnifiers and stand magnifiers.

The albino patient and the patient with achromatopsia are usually light sensitive and extraneous light can be a problem so it should be screened out. Most albinos get good results with high adds and some get improvement with contact lenses with artificial pupils. Many of the above patients with cogenital defects also have nystagmus which responds well to magnification which can decrease the nystagmus.

In this category, patients without a fiels loss, I reviewed the records of 22 patients. Of the 22, 10 had nystagmus, 2 were albinos with nystagmus, 5 had cataracts, 4 had aniridia with nystagmus and 1 patient had bullous keratopathy. The acuity range for these patients was 20/30-no light perception. The patients with nystagmus showed a definite trend towards telescopes with caps. The cataract patients got the most benefit from high adds and an increase in illumination.

In this study of a random sample of low vision patients from Ferris the limiting factors were the number of patients studied for each group and the inability to correlate the patients attitude, acuity and needs with the aids that were prescribed. I feel that by using a larger sample of patients and a computer, I could have taken more variables into account. For example, the number of patients with albinism and aniridia was too small to be conclusive about the aids prescribed.

Mehr and Freid[3] state four keys to prescribing which I think are important: 1) the patient must have a specific task, 2) he must function better with the aid than without it, 3) he must know what the aid will look like, 4) he must show the ability to use the aid.

In a low vision evaluation there is a lot of interaction and communication with the patient and the examiner. The examiner must strive to be thorough and efficient, and an important part of accomplishing that is the understanding of the patients needs, attitude and the integrity of his visual system.

3 Edwin B.Mehr and Allan N.Freid, (Professional Press, Inc, 1975), p.119.

Here is a table of the number and type of aids prescribed for each condition and type of field loss

AID PRESCRIBED	CENTRAL LOSS	MACULAR DEGEN.	OPTIC ATROPHY
Hand magnifier		7	8
Illum. hand magnifier		4	0
Stand magnifier		8	2
High add		4	4
+8 & +10 half-eyes		1	4
Loupe		1	1
E-Z view		3	2
Microscope		4	3
Telescope		6	22
High illum.		12	1
Typoscope		2	1
NoIR & sunglasses		2 & 4	1 & 4
CCTV		0	3

AID PRESCRIBED	PERIPHERAL LOSS	RET. PIGMENTOSA	DIABETES	GLAUCOMA
Hand magnifier		3	-	1
Illum. hand magnifier		-	-	-
Stand magnifier		1	-	-
High add		-	1	1
+8 & +10 half-eyes		-	-	-
Microscopes		-	-	-
Telescopes		2	-	-
High illum.		-	-	-
NoIR & sunglasses		2 & 1	-	-
CCTV		-	-	-

AID PRESCRIBED	NO FIELD LOSS	CATARACTS	NYSTAGMUS	ANIRIDIA & ALBINISM
Hand magnifier		2	--	--
Illum. hand magnifier		--	--	1
Stand magnifier		--	1	--
High add		3	3	1
+8 +10 half-eyes		--	--	1
E-Z view		--	--	1
Microscope		--	--	--
Telescope		1	12	2
High illum.		1	--	1
Typoscope		1	--	--
NoIR & sunglasses		--	1 & --	2 & --
CCTV		--	--	--

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