Low Vision Management

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Introduction

Low vision has been a subject of continued neglect for years by ophthalmologists for various reasons. But in reality it is only the willingness of the professionals to take up this field to the cause of prevention of unavoidable blindness.

The difficulty in availabilty, accessibility, and the high cost of low vision devices which has been sighted as problems in this field can be overcomed only if large number of ophthalmic professionals involve, support, and address this issue seriously.

This article is an insight of low vision management and rehabilitaion with respect to various diseases.The global initiative for elimination of avoidable blindness, include low vision as an important cause. The strategies are:

1. To develop and make low vision services available and optical devices for all those in need, including children in blind school, and integrate education.
2. To include provision of comprehensive low vision care as an integral part of national programmes for the prevention of blindness on rehabilitative services for the visually disabled.

Definition

By the 'WHO' Definition- "A person with low vision is one who has impairment of visual functioning even after treatment, surgery or standard refractive correction and has a visual acuity of less than 6/18 to light perception or a visual field of <10 degrees from the point of fixation, in the better eye but who is potentially able to use, vision for the planning and or execution of a task".

Low vision aids

Low vision aids on a broad classification comprises

1. Optical aids
2. Non optical aids

Optical aids consists of

1. Telescopes
2. Ashperic lenticular spectacle lenses.
3. Hand magnifier
4. Stand magnifier
5. Fresnel prism
6. Prismospheres
7. Paper weight magnifier
8. Bar magnifier
9. Pocket magnifier
10. Electronic aids as Closed Circuit Television system

Non optical aids

Includes seven categories of AIDS :

1. Large print books
2. Reading stand that supports posture and comfort.
3. Illumination devices such as fluorescent lamps and glare control devices such as photochromatic glasses.
4. Writing devices as typoscopes
5. Medical management devices as insulin syringes with bold letters
6. Mobility canes
7. Sensory substitution devices such as talking books

Ocular conditions benefited by low vision aids are

1. Albinism
2. Central serous retinopathy
3. High myopia
4. Microphthalmos
5. Diabetic retinopathy

Ocular conditions where there is not much benefit from low vision aids <2/60 and field of vision is <10 degrees.

1. Retinitis pigmentosa
2. Advanced glaucoma
3. Optic atrophy with field defects

4. Retinal vascular occlusion
5. Macular Dystrophy

Low Vision Evaluation

Evaluation of a low vision patient begins with assessment of the clinical background, functional assessment, vocation, independence in daily living activities, mobility, social interaction, psychological reaction, reading and writing performance with patient's stated needs. It is more important to evaluate the patient as a whole, and a holistic approach is required. Just recording the complaints and examination will not help to support the patient.

The optometric evaluation includes vision examination present using a 1 meter or 3 meter chart. The patient has to be seated at a specific distance. The chart has a geometric progression of letters with lines equivalent to the standard snellen visual acuity. This chart has logarithmic units and the diopteric add on the right side and letter size in 'M' units on the left side. This is the Logarithmic Visual Acuity Chart 2000 by the precision vision company. This chart is very useful in evaluation of the low vision patient. The refraction is done at one meter distance, using radical retinoscopy. Bracketing method can be used subjectively to arrive at a proper refractive correction. Majority of our low vision patients will be benefited by LVA for near vision. All that is required is a motivation to use a low vision device and the need to use it professionally.

The following formulas are useful in the day to day low vision practise.

1. "Kosten baum rule"

Is the reciprocal of the distant snellen visual acuity. e.g. if the distant snellen visual acuity is 6/60 then the reciprocal will be 60/6 = 10D, where a patient will require 10 D add for near vision.

2. Brazelton formula

Here the magnification = Best corrected Distant Visual Acuity x 2.5 x.

3. Light House Method

The light house near visual acuity card can be used at 40cm test distance requiring an add of + 2.50 D. The add can be increased depending on test distance even upto 10cm. The chart gives the letter size in 'M' units on left side and diopteric add on right side.

The Halberg trial clips makes the refraction more quick, convenient and accurate as the errors arising out of vertex distance, pantascopic tilt, especially delete high errors are eliminated.

The optometric evaluation also includes visual fields examination using amsler grid, central and peripheral fields. If the scotoma recorded in amsler grid is more than 30 degrees from fixation then the use of a magnifying spectacle is guarded. The central and peripheral fields are documented. If the fields are constricted more than 10 degrees then the use of a telescope may not help the patient.

Contrast sensitivity is recorded to help in the functional vision testing of a low vision patient. Having gathered all the information a trial of low vision devices is given with telescopes for distance and the hand or stand magnifier for the near work. The required illumination, glare control devices, contrast requirement are also explained to the patient.

In the following description specific low vision management pertaining to different ocular conditions are discussed.

Low Vision Management

Anterior Segment

Corneal Opacity

This problem causes a over all blur and an artificial pupil contact lens will be more helpful. The opacities causes scattering of light, which has to be controlled by appropriate filters, and especially orange coloured filters are more Beneficial.

Corneal Dystrophies

Pinhole spectacle lenses and aperture control contact lenses reduce aberrations and ghost images, delete caused by corneal dystrophy as well as reduces glare. Non optical system as large print, bold line notes, typoscopes are helpful.

Aniridia

Pupillary aperture control contact lenses with Iris colour tint reduce photophobia, improve visual acuity and reduce nystagmus.For photo phobic complaints direct illumination, filters and sunglasses are beneficial.

Dislocated lens

Correction of aphakic eye with spectacle or contact lens will be the first option if no surgical option is

feasible like a one eyed patient or with coloboma where a detachment is possible. Magnifiers may be required for loss of accommodation. Diplopia can be eliminated by pinhole lenses, stenopic slits or aperture control contact lenses.

Posterior segment

Retinitis Pigmentosa

The most challenging experience will be in managing an RP patient with constricted fields. Though field expanders are recommended for these patients, majority of the patients will not accept such a device. The field of vision can be expanded only by magnification of target with a reverse Galilean telescope. Mirrors angled at 45 degrees and fresnel prisms are mounted on spectacle frame to reflect or deflect light rays so that retina of the intact field can be utilised. Patients who travel at night alone are advised to use search lights. For these patients light is a medicine at dark.

Coloboma

Aperture control contact lenses or painted iris contact lens can help either cosmesis and glare caused in iris coloboma patients. These patients function better with reduced illumination.

There is a superior field loss by posterior coloboma. Patients are instructed about field loss due to superior coloboma and explained how to navigate indoors.

Diabetic Retinopathy

Use of contact lens in diabetes is controversial because of compromised corneal sensitivity.

Due to fluctuation in diabetic status change in refractive status should be kept in mind when they come at frequent intervals.

Eccentric viewing, using preferred retinal locus with magnification devices should be given in case of patients with macular involvement. Electronic aids such as CCTVs can be of help in magnification in patients less than 3/60 vision. The CCTV enhanses the contrast sensitivity with a reversed polarity as Diabetic Retinopathy patients have reduced contrast sensitivity.

Non optical devices such as glucose blood sugar monitor and insulin syringe aids are specific devices prescribed. Flash light for patients with poor night vision.

Due to the media opacities and patchy field defects, caused by Haemorhages and exudates it is better to use binocular lens than monocular lens to enhance binocular vision. A hand or stand magnifier retains binocular vision than a monocular aspheric lens. A flip in or a clip on brown or orange filters with side shields should be used to avoid a glare.

Macular Degeneration

Before giving a low vision trial the amsler grid test is important in assesing the extent of scotoma. Most of the patients will benefit from an eccentric viewing using a preferred retinal locus, with a viable healthy retinal tissue. Prismospheres are suitable low vision device, which shifts the macula scotoma. Prismospheres are available in the range of + 5.0 D and + 8.0 D, base in prisms.

When the scotoma is to the right of the macula reading becomes difficult as the next word disappear. If the scotoma is to the left of the macular difficulty is experienced in tracing the beggining of print line. These patients will require high level of illumination above 1000 lux.

Increased direct illumination should be recommended for all near tasks, non-optical systems, filters, tints and sun glasses for improved contrast glare and photophobia should be evaluated.

Glaucoma

This is the most challenging field in low vision management. For patients with intact central acuity and in peripheral field loss reverse telescopes are used to enhance patients field of view.

But the acceptance is poor in our setup. Fresnel reflected prisms or mirror systems may stimulate peripheral awareness. Electronic magnification system such as Closed Circuit Televison are useful because they allow increased contrast, and brightness along with magnification.

Field defects

For patiens with bitemporal hemianopias or right or left homonymous hemianopias it becomes a problem navigating outdoors and it is dangerous while driving car or two wheeler.

For these patients hemianopic spectacles can be

used with training . This is a spectacle, where a coated mirror is fixed nasally to the field which is lost so that it is reflected on the seeing side. Though cosmetically it looks cumbersome, on the safety point of view it is very useful to the patients.

Stick on fresnel prisms are used to expand the fields, but if the reflecting mirror if fitted properly should solve the problem with patients having bitemporal hemianopic due to chiamatic injury.

Myopic degeneraion

A high myopia having the near point of accommodation closer to the eyes will be able to read small prints closer to the eyes. Contact lens serve as a better low vision aids in high myopia.

In myopia spectacle lens produce minification of images. The contact lenses serves as an advantage over spectacle lens of same power. Contact lens eliminates the peripheral distortions and prismatic effects.

When using spectacle lens, small round frame, high index lens with antireflective coating help to reduce edge thickness and peripheral distortions. For refractive errors more than -15.0 dioptres a myo disc lens can be used.

Achromatopsia

These patients function better in an environment with reduced illumination. Red tinted contact lenses and red sun lenses used to decrease photophobia with some success. Side shields on spectacle frame along with hats with large brim is helpful outdoors.

Nystagmus

Nystagmus tends to reduce on accommodation, and increase on dissociation. The VA is related to amplitude of movement. Prisms base out can help some times. Contact lens telescope can be tried.

Correcting high refractive error reduce nystagmus and improve acuity. Increased acuity is acheived by increased foveation time, which occurs if patient is fixated at null point. Best acuity is achieved in particular gaze position that yields the best wave form and not the least amplitude.

Patients may develop head turns to a particular position in the null area which can be achieved with prism spectacles.

Paediatric vision rehabilitation

The impact of low vision in children is multifactorial. It involves the growth and development, psychomoter, cognitive and affective aspects. It also results in a cycle of impact resulting in decreased feed back from the external world due to lack of visual communication causing imperfect concepts about the objects. Vision rehabilitation in a child is a joint responsibility involving parents, teachers, psychologists and rehabilitationists. The greater accumulative reserve in the children makes reading text at near. If the distant vision is less than 6/60, they will need a telescope for board work.

Albinism

Usually associated with nystagmus photophobia, and diminished vision, soft cosmetic, contact lens with an opaque iris and a clear pupil will be useful. Majority of the albinotic patients will be benefited by the photochromatic tinted glasses like the A2 crooks to avoid a photophobia. A cap to avoid sunlight should be insisted. For the achromatopias red on orange tinted lenses will be helpful. In albinotics ossilopsia is absent, nystagmus is not a contraindication for telescopic lenses distant magnification. Albinotic patients are ideal candidates for magnification due to absence of central or peripheral field defects.

It is best to correct refractive errors as it improves vision and reduce nystagmus. Some albinotic patients have found that it is easier to read if the material is rotated at an angle where as others may assume a compensatory head tilt as it is believed that the horizontal component of nystamus is less bothersome in this fashion.

Retinopathy of prematurity and visual rehabilitation by early intervention

With R.O.P. screening gaining importance in many institutions, it becomes essential that the low vision and rehabilitative management aspects of these children also to be considered.

An early intervention programme has to be sorted out based on the assesment of visual and other sensory skills that are lacking and appropriate training should be given to improve those skills. High myopic error can be corrected with conventional spectacle

and ARC coating. A box made of hollow space where the child is placed and then toys and lights for stimulation are placed inside it for visual and tactile stimulation.

This has got a woodden platform over which the baby is placed such that the sounds are produced by tapping are resonated to stimulate the baby. Such a box is called the be active box which keeps the baby active.

Early intervention programme of R.O.P. children is particularly a team approach with joint responsibility of ophthalmologists, neonatologists, rehabilitationists and parents for succesful early intervention.

Low vision optics

Types of Magnification

Relative Distance Magnification

If a patient can read 8m print at 16 inches, then moving the print twice as close will allow him to read 4m print. Moving the reading material 2 inches, will allow reading 1m print.

The accommodation or a near add can be thought of as magnification in the sense that it allows the principle of relative distance magnification to operate as objects that are held closer and appear larger.

Relative Size Magnification

The most obvious example is the large print books like Reader's Digest; relative size magnification enlarges the object so that it can be seen better. In every day life such large sign boards kept in airports, railway stations help people with vision impairment to see better.

Angular magnification

The magnifying lens takes the light rays from the object being viewed and projects them at an increased visual angle to produce an enlarged virtual image of the object on the retina.

Projection magnification

Here the user sees an image of the object that is projected electronically. The best example is a Closed Circuit Telelvision system or a video eye which has been recently utilised.

Magnification Ratings

The two most prevalent are the American and European systems. The American system magnification is =diotres / 4. A +12.0 dioptre lens for example is called 3x. The European system magnification is=dioptre / 4+1x. In this system a +12.0 dioptre lens is called 4x.

The rating of magnifiers by dioptres

Successful low vision dispensing tends to be an art that is dependent on the practitioner's experience.

Dioptre and focal length of lenses

If parallel rays of light enters the lens, they will be bent to focus at the focal point of the lens. If a magnifier has 5 dioptres then its focal length is 1 meter / 5 diopter=0.2meters.

When strong reading spectacle are dispensed it is most helpful to know where to instruct the patient to hold the reading material.

Manufacturers typically list the diopteric power of a magnifier by its vertex power which usually overates the power of the magnifier.

Vertex power is the reciprocal of the distance between the lens surface and the corresponding focal point. This focal length is shorter than that found from the equivalent power.

Equivalent power is the reciprocal of the distance between the principal plane and corresponding focal point. The equivalent power expresses the magnifiers correct strength because it compensates for the thickness or multi-lens construction of powerful lens system. In short when the focal length is shorter the dioptre power is higher.

Low Vision Aids comprising + 6.OD Hand Magnifier, 2 x Bar Magnifier, Loupe, 4 x Dome Magnifier

Image location in magnifiers

If a magnifier is held so that the object being viewed

Patient using Stand Magnifier

Patient using Hand Magnifier

is in the focal plane of the magnifier the virtual image of the object produced by the magnifier will be at optical infinity.

Conclusion

The above descriptions are only a birds eye view of the science of low vision.

Low vision managment has to be individualised according to the patients needs and has to be tailor-made depending on various factors such as age, profession, and patient's needs.

Though the management of some diseases is specific, more importance is given to the patients requirement; only what is most appropriate in treating low vision in a given environmental condition.

Suggested Reading

1. *Advanced low vision optics William, B.Mattingly,MA,ABOM Journal of Ophthalmic Nursing and Technology.*
2. *Light house hand book on vision rehbilitation.*
3. *Essentials of low vision practise.*
4. *Guide Book Low vision by Vaithialingam, Sankara Nethralaya Publication.*