VISION

Low Vision Aids

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JAYPEE

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JAYPEE BROTHERS
MEDICAL PUBLISHERS (P) LTD
New Delhi

Published by

Jitendar P Vij
Jaypee Brothers Medical Publishers (P) Ltd
EMCA House, 23/23B Ansari Road, Daryaganj
New Delhi 110 002, India
Phones: +91-11-23272143, +91-11-23272703, +91-11-23282021, +91-11-23245672
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Low Vision Aids

First Edition: **2006**

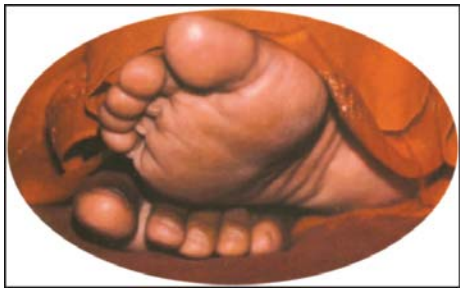
ISBN 81-8061-789-0

Typeset at JPBMP typesetting unit

Printed at Paras Press

Dedication

This book is dedicated to my low vision patients, including my father, who showed me the light.



PREFACE

Very often an eye care professional has no answer to the patient's eye disorders and they helplessly answer–'Sorry, nothing can be done.'

The main objective of this book is to give them the answer that – something can be done even, after the best of medical and optical intervention has given up. To lose vision and adapt to the word visually disabled is a mental trauma for the patient and his family. The problem is that, many eye care professionals still do not realize and understand the importance of low vision services, and advise or refer them for such services. The patient lives all life-long dependent and handicapped just because the practitioner did not understand the importance of low vision devices, which would have made his life simpler and independent.

Although we are now having an increased awareness and increasing number of low vision centers in our country, yet the facilities are far too less. The government targets in future are quite promising in this sector.

Encouraging the young residents in ophthalmology and optometry to recognize the importance of enabling the partially-seeing to utilize the array of these services should be a priority.

The purpose of this book is also to explain that the practitioner can guide and provide basic low vision care to each patient in his small set up also. The patients are often grateful, satisfied and will have confidence in your treatment, that you have done your best.

The target and answer should thus be we still can do something.

The purpose of this book is to make you:

- Understand the meaning of visual acuity in relation to normal vision, low vision and blindness. To identify people with low vision as distinct from those who have normal vision and those who are blind.

- Understand the effect of low vision.
- Describe problems that people with low vision face.
- How distance and near visual acuity is tested in low vision center.
- Understand the meaning of magnification and its different powers.
- How to prescribe low vision devices in the correct way, list advantages and disadvantages of each and teach a person with low vision how to use them.
- Understand the importance of rehabilitation and identify those who need it.
- Some addresses from where the devices can be procured.

Low vision services do not cure the cause of the vision problem but rather utilize the remaining vision to its fullest potential. Low vision care does not replace the need for other concurrent treatments such as laser, medication and surgery. Low vision doctors prescribe prescription eyewear, filters, microscopic — telescopic eyewear, magnifiers, adaptive equipment, closed circuit television systems, independent living aids, training and counsel patients.

The objective of low vision services is to provide special training or equipment so that visually impaired can join in activities in the home, school and community.

Monica Chaudhry

ACKNOWLEDGMENTS

I offer my sincere thanks to all those who helped me in writing this text. Without their dedication, it might have not been possible to bring out this publication.

First of all I thank my esteemed teachers Prof. VK Dada and Dr. Sarfaraz Khan who taught me whatever little I know about low vision. I am grateful to Prof. HK Tiwari who inspired me to work in this field.

A special word of thanks goes to Mr. Harminder Singh for his unstinting support for all the photographic work.

I am also grateful to Shivani Chawla for the art work and Prof. JS Titiyal for his able assistance.

Last but not the least I thank my publishers M/s Jaypee Brothers Medical Publishers (P) Ltd, New Delhi for providing excellent editorial and production expertise.

CONTENTS

What is Low Vision?

1

Low vision is insufficient vision, despite wearing the best possible corrective lenses or contact lenses or in other words, to be unable to do the things you want to do.

Or

Vision loss that cannot be corrected by ordinary glasses, contact lenses, medication or surgery is called "low vision."

Or

Low vision is the vision which interferes with the daily performance of the individual.

Or

Low vision refers to a significant reduction of visual function that cannot be corrected to normal range by ordinary glasses, contact lens, medical treatment or surgery.

The following is the *World Health Organization's definition of low vision.* This is widely-used internationally.

A person with low vision is one who has impairment of visual functioning even after: treatment, for example an operation and/or standard refractive correction (has been given glasses or lenses) and has *a visual acuity of less than 6/18 to light perception, or a visual field of less than 10° from the point of fixation* (i.e. 20° across) but who uses, or is potentially able to use, vision for the planning and/or execution (doing it!) of a task.

It is important to note that if a person's vision improves with contact lenses or spectacles to better than 6/18 may not be considered to have low vision. However, low vision criteria only follows when the best-corrected visual acuity is less than 6/18.

A low vision person is one with visual acuity of 6/18 or less in the better eye even after the best possible correction.

If one has low vision, also known as partial sight, it's important to maximize the vision one has.

*The **low vision services*** are provided by specially trained optometrists and ophthalmologists and include a thorough eye examination, an evaluation of remaining vision and the prescription of optical devices/non optical device, such as high-powered spectacles and magnifiers, to enhance the images that one can see.

Is Low Vision the Same as Blind?

No, blindness is a total lack of vision. If you have a partially-sighted person the word blind should be avoided in any form except where absolutely necessary for legal reasons such as for government benefits. Most legally blind persons have some usable sight but because the word blind is used they are often mistaken as someone without sight.

Diagnostic grouping of blindness is the one who has either:

1. No light perception
2. Light perception and projection
3. Central acuity upto hand movements with gross field loss.

Low Vision or Blind?

Perhaps it has been found on general screening through some of our blind schools where the children are termed blind and admitted to these schools, made to read Braille, whereas these children had some residual vision which could have been utilized and improved by low vision devices, such that they could read print and may be lead a better life. Braille as we know is not utilized much in our country except for some signs in some elevators. So, practically by educating them with Braille we have not been actually able to serve them. The service is to rehabilitate these low vision patients specially children. With cooperation from the schools, teachers and parents it is very much possible to get them out of the black world of blind.

BASIC DEFINITIONS

Normal Vision

A person is able to perform all close and distant visual tasks that are normally expected in his community. Refractive correction (e.g. glasses) may be needed to give 'normal' vision. A person with 'normal' vision is someone who has between 6/6 and 6/12 (20/20 and 20/40) vision.

Vision Impairment

Refers to conditions with decreased visual acuity from blindness to partial sight.

Blindness

It is defined as, no usable vision with exception of light perception.

Economic Blindness

It is defined as, visual performance with distance visual acuity of 6/60 or less in the better eye with best ophthalmic correction or as a defect in visual field so that the widest diameter of vision subtends an angle no greater than 20 degrees.

Functional Vision Impairment

Refers to significant limitation of visual capability, that is manifested by insufficient visual resolution, inadequate field of vision, reduced contrast acuity. Functional impairment prevents or causes difficulty in performing tasks or daily activities.

Functional Vision

This refers to the use of vision for a particular purpose. Even small amounts of vision can be useful, for example to recognize a person close up, or to avoid objects. The use made of vision depends on a person's experiences and can vary with different

conditions. Functional vision may be improved with refractive correction, low vision devices or instruction in the use of vision.

Legal Blindness

It is the legal definition used to determine whether an individual with vision impairment is eligible for government benefits. It is 6/60 or less with best correction or a visual field of 20 degrees or less in the widest meridian of the better eye.

Vision Rehabilitation

Are services provided to both who are partially sighted and those who are blind. These services include mobility training, adaptive skills training, low vision instruction career services and training, psychological counseling and others.

Travel Vision

- When vision is 3/60 or better
- And peripheral field of vision is at least 50 degrees in the widest diameter.

Partially-Sighted Child

One who has distance VA between 6/24 to 6/60 in the better eye with the best correction.

All These Definitions do not Consider and have Their Limitation

1. Near vision
2. Scotoma, hemianopia and latent nystagmus
3. Visual performance like contrast
4. Improvement with contact lens.

What Are Low Vision Aids?

Low vision aids are devices which help people use their sight to better advantage. These aids may be optical lenses, such as

magnifiers or telescopes, or non optical devices, such as visors, filters, reading slits, stands, lamps and large print.

How do Low Vision Aids Work?

Low vision aids may make things larger: they may make things brighter, they may make things clearer, and they may improve contrast. Some may do more than one thing, but generally, all low vision aids make it easier to see something by magnifying it to the level one can see.

Impairment Disability Categories – As Laid Down by Indian Government

Category No	*All with correction*		*Percent of blindness*
	Good eye	*Worse eye*	
1.	6/9 – 6/18	6/24 – 6/36	20%
2.	6/18 – 6/36	6/60 to nil	40%
3.	6/60 – 4/60	3/60 to nil	75%
4.	3/60 – 1/60	CF 1 ft to nil	100%
5.	CF 1ft – nil	CF 1 ft to nil	100%
6.	6/6	nil	30%

Magnitude of Low Vision

2

It is generally recognized that the problem of low vision is significant and is rising rapidly. There is a need to increase awareness of the low vision services among the eye care professionals.

The True Magnitude

The true magnitude of the low vision is not known or precise mainly because:

1. There is no standard protocol and uniform definition of low vision.
2. Incomplete surveys and statistical classification of eye diseases around the world.
3. The low vision definition does not include standards of near vision, which is the main area dealt with low vision patients.
4. Prevalence of blindness and low vision vary between regions and are based on regional criteria's or definitions.

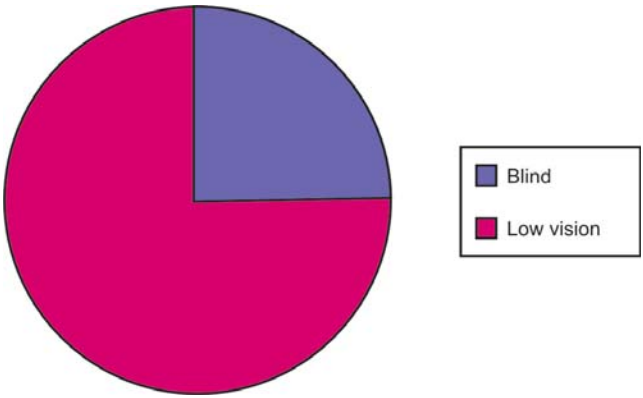
Current Blindness and Low Vision Data: (WHO)

Number of visually impaired around the world	180 million
Number of blind among these	45 million
Number with no perception of light vision	9 million
Those with some residual vision	180 – 9 = 171 million

Of these 171 Million

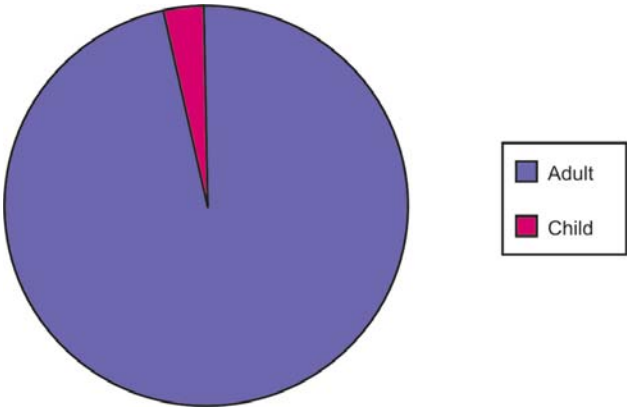
Number with vision from more than PL to 3/60	36 million

Number with vision from 3/60 to 6/18	135 million
Number who can benefit from treatment (e.g. cataract surgery)	103 million
Residual who are true low vision patients	68 million



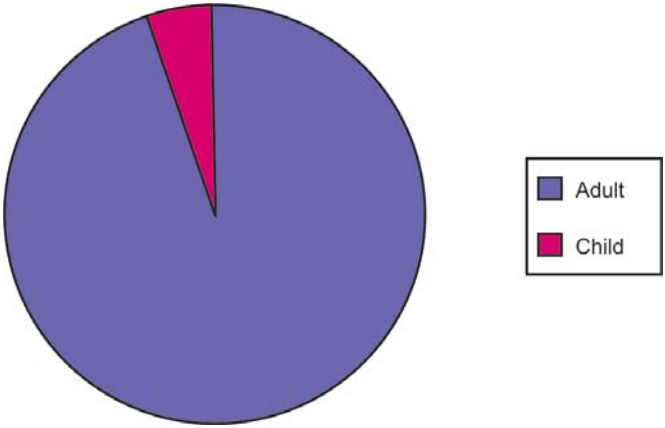
Total number of visually impaired = 180 million
number of blind = 45 million
Number low vision = 135 million

Adults vs Children



Number of blind children out of 45 million blind = 1.5 million

- 1.5 million worldwide (Foster and Gilbert, 1992)
- 1 million in Asia (WHO, 1992)
- 0.25 million in India (Dandona et al. Arch Ophthalmol 1998)



Total Number of low vision patients = 135 million
Number of low vision children = 7 million

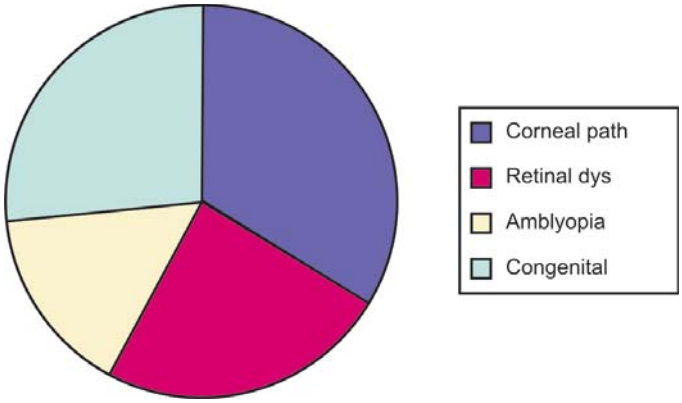
Number of Blind Person Years

Although the number of blind children is much less as compared to blind adults, yet the magnitude of childhood blindness get magnified *if it is calculated in the number of years a blind child has to live compared to an adult*. Calculating on the basis of this the blind – person years of childhood blindness comes next to cataract blindness data around the world.

Causes of Childhood Blindness Worldwide

The data is based on the information from registers of blind and school surveys. This varies from region to region. In most regions of the world 50 percent of it is avoidable.

There is no proper data regarding this information in children in India. Though data from schools suggest the following incidence in India and calls for urgent epidemiological research in this area of visual impairment.



Of the 7 million low vision children in the world.
Number of low vision children in India = 0.5 to 1 million approx (no complete study is available).

Economic Burden due to Childhood Blindness in India

In India the cumulative loss of 0.25 million childhood Blind and for 33 working years of life is rupees 801 billion, which is 28.7 percent of the cumulative GNP loss due to all blindness (Shamanna et al. Indian Journal of Ophthalmology, 1998).

Vision 2020: The Right to Sight

Vision 2020 is a global initiative launched by the World Health Organization and task force of International Nongovernmental Organizations to combat the gigantic problems of blindness around the world.

Globally five conditions have been identified as achieving the goals of vision 2020, they are:

- Cataract
- Trachoma
- Onchocerciasis
- Childhood blindness
- Refractive errors and low vision

Refractive Errors and Low Vision

Spectacles are an essential part of the treatment of many eye patients and provision of glasses forms the integral part of the treatment. *Vision 2020 aims at:*

- Screening of refractive errors, evaluation of refractive errors and dispensing of spectacles
- Elimination of visual impairment – Vision less than 6/18 and blindness due to refractive errors or other causes of low vision.
- The aim goes beyond the elimination of blindness and also includes the provision of services for the individuals with low vision

Vision 2020: The Right to Sight in India

India was the first country in the world to launch the National Programme for Control Blindness in 1976 with the goal of reducing the prevalence of blindness. Of the total estimated 45 million blind persons (best corrected visual acuity < 3/60) in the world, 7 million are estimated to be in India. Due to the large population base and increased life-expectancy, the number of blind particularly due to age-related disorders like cataract, is expected to increase. *India is committed to reduce the burden of avoidable blindness by the year 2020 by adopting strategies advocated for Vision 2020 – The Right to Sight.*

CURRENT STATUS OF INDIA

Extent of the Problem

Three major surveys have been conducted to find out the prevalence of blindness in the country. The first survey undertaken by the Indian Council of Medical Research (ICMR) in 1974 indicated a prevalence rate of 1.38 percent in the general population (Visual acuity < 6/60). In the second survey sponsored by the survey of India/World Health Organization (1986-89), the prevalence rate increased to 1.49 percent (presenting visual acuity < 6/60 in the better eye). As per

Information available from various studies, there are an estimated 12 million bilaterally blind persons in India with visual acuity less than 6/60 in the better eye, of which nearly 7 million have visual acuity less than 3/60 in the better eye (presenting vision). Recent survey (1999-2001) in 15 districts of the country indicated that 8.5 percent of the population aged above 50 years is blind.

Main causes of blindness in 50+ populations are as follows:

- Cataract 62.6 percent
- Refractive Errors 19.7 percent
- Corneal Blindness 0.9 percent
- Glaucoma 5.8 percent
- Surgical Complications 1.2 percent
- Posterior Segment Disorders 4.7 percent
- Others 5.0 percent

There are no nationwide reliable data on refractive errors and low vision in the country except some isolated studies. A survey was conducted in Delhi to assess the prevalence and causes of blindness and low vision in children aged 5 to 15 years. The survey indicated that 1 percentof children in this age group had vision < 6/18 in the better eye, that is low vision children.

Statistical analysis of eye care infrastructure or low vision care services (resource — Ministry of Health and Family Welfare, D.G.H.S and Dr R.P. Centre).

1. Medical colleges with low vision clinic 35 out of 140 (25%)
2. Institutions with low vision clinic 13 out of 24 (54.2%)

Indian Targets for the year 2002 – 2007

Low vision services to be initiated at tertiary level with adequate linkages with secondary level and with primary care in phased manner. Under this the target is to have basic refraction services available in all districts in the country and establish low vision centers at 50 institutions (centre of excellence/training centers) in the phased manner. The ultimate is to constitute a task force to develop strategies for low vision services.

Optics of Low Vision Devices

3

The basic principle of all low vision optical devices is to magnify.

The specified magnifying powers of most of the available aids are computed from the single formula

$$M = D/4$$

Magnification = Dioptric power/4

This formula works on the assumption that with the unaided eye the patient can sustain just enough accommodation to hold the matter at 25 cm. It also assumes that when magnification is used, the reading material is placed at principal focal plane of the lens (Neither of these assumptions is practically true in practice). Thus, magnification can be varied by changing the distance from the object to lens. This group includes spectacles and hand magnifiers.

The formula can thus be written as $M = D + A/2.5$ where A is the amplitude of accommodation.

If the distance between eye and lens is appreciable then magnification is given by the formula

$$M = D + A - h\,AD/2.5$$

Where h is the eye lens distance in meters.

This implies that :

- The eye should be kept close to the lens to reduce h and increase magnification.
- Reading matter should be as close to the patient's eye as far as his accommodation allows.
- If the optical lens distance is predetermined the object is placed at fixed distance magnification is maximum if the eye is as close to the lens. This is used in stand magnifiers.

It is, thus, correct to specify the power of the magnifier or the device in Diopters than the X notation. As each manufacturers calculation may not match the X notation. Still this holds fairly true for all practical purposes and calculations.

Multiply the amount of magnification by 4 to get the "Dioptric Power" of the lens. Divide the Dioptric power into the number 40 to get the number of inches from the eye.

For example, a 4X lens is 16 Diopters. Divide into 40, we get a 2.5" working distance; a 5X lens is 20 Diopters and has a reading distance of 2 inches

MAGNIFICATION CONSIDERATIONS IN LOW VISION DEVICES

Low vision devices make use of either of these four or a combination of these types of magnifications. They are:

1. Relative size
2. Relative distance
3. Angular
4. Electro-optical

Relative Size

Means enlargement of the size of the object. This does not use an optical system. It is simply making the object bigger to the visual acuity levels which the patient has, e.g. large print textbooks (Fig. 3.1).

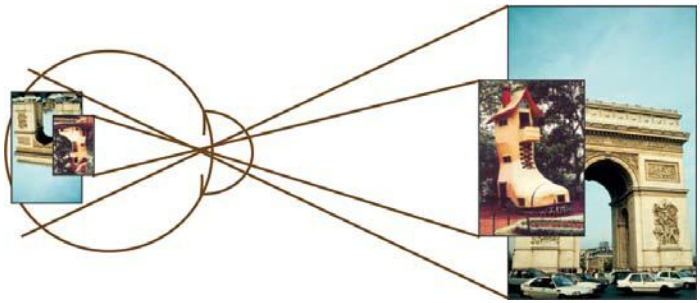


Fig. 3.1: Relative size

Relative Distance Magnification

Is achieved by moving the object of regard towards a person to subtend a larger image on the retina. The magnification is inversely proportional to the change from the original distance. An optical system, the common magnifiers are usually required for this (Fig. 3.2).

Angular Magnification

It is the apparent change of size of the object compared with the true size of the object seen without the device. This type of magnification is generally produced by telescopic systems (Fig. 3.3).

Electro-optical Magnification

This is produced by electronic systems which enlarge the objects directly by scanning or are computer generated.

There are four ways to make objects look larger

1. Bring object close: 2 times closer makes object 2X bigger. An object close to the eye requires a lot of accommodation.

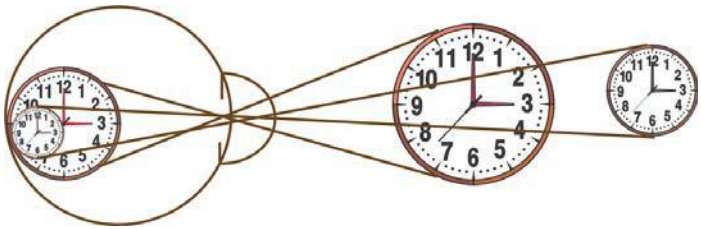


Fig. 3.2: Closer-relative distance magnification

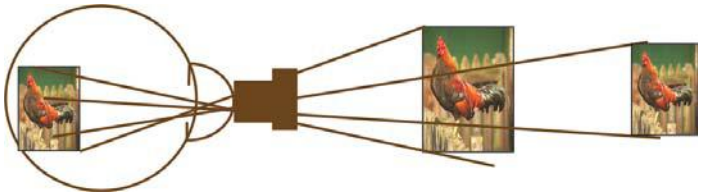


Fig. 3.3: Angular magnification

This is possible for children but is more difficult for adults. Children can magnify print and small objects by holding them very close to their eyes, so some children will not need magnifiers to see near objects

2. Enlarge the object
3. Use an optical device
4. Electronic and projection magnification

Higher magnification leads to (Fig. 3.4):

1. Smaller field
2. Closer working distance
3. Needs more illumination
4. Greater difficulty in using
5. Reduced depth of field.
   - The higher the magnification (the smaller the field of view)

So, though a 6X magnifier will give higher magnification than a 3X magnifier, yet it has its limitations. The size of the magnifier lens reduces, and the working distance and the depth of field are also reduced. Likewise a 3X telescope will have 12.5 Degree field and a 4X will further have reduced field of vision to about 10 degrees. The selection of the device will thus, depend upon these factors and not only on the level of magnification targeted.

PREDICTION OF ADD

The calculations of the Dioptric add for low vision patients can be done by 2 methods:

1. *Reciprocal of Snellen's visual acuity* : For example: suppose the patient reads 2M print, the Snellen's equivalent is 6/30 or 20/100. The reciprocal of 20/100 is 100/20, which is equal to 5 Diopters. Reciprocals can be calculated for any test using metric or Snellen's notation.
2. *The reciprocal of the distance*: For example: the near acuity tested at 40 cm is suppose 2M to make 1M print readable the patient must thus hold it at 20 cms (due to magnification of the retinal size of the image). The add thus required is 100 divided by 20 (the distance) which is 5 Diopters.

Also, if the vision was 4M at 40 cm to read 1M. The patient will now have to bring it closer to 10 cms to read. The add thus required is 100 divided by 10 = 10 Diopters

A predicted number of Diopters of spectacle add required by a person with impaired visual acuity to read a desired print size, its calculations are based on the corrected visual acuity.

To determine the add, you must therefore determine the corrected acuity, and the goal of the size print first.

The power of the magnifier can be calculated from Log MAR visual acuity.

Suppose the best corrected acuity is 6/60 or 0.10. The target visual acuity is 6/12 that is 0.5.

Magnification required = Denominator of vision required
= 60/12 or 0.10 /0.5
= 5X

Thus, 5X magnifiers should be tried for this patient.

Fig. 3.4: Magnification

VISUAL ACUITY SCALES – THEIR COMPARATIVE VALUES

Snellen' Meters	*Metric print size*	*Snellen' Feet*	*A series*	*%*	*Near Jaeger*	*Near Times New Roman*	*Diopters of add for IM at 40 cms*	*Decimal*
6/6	0.4M	20/20	A1	100				1.0
			A2	80				
6/9	0.6M	20/30	A3	64				
			A4	51	J1			
6/12	0.8M	20/40	A5	41				0.50
	1.0M	20/50	A6	33	J4	N6	2.50D	
6/18	1.25M	20/60	A7	26	J6	N8	4.0D	
6/24	1.6M	20/80	A8	21	J10	N10		0.25
	2.0M	20/100	A9	17	J12	N12	5.0D	
6/36		20/120	A10	13	J14	N18		
			A11	11				
6/60	4.0 M	20/200	A12	8.6			10.0D	0.10
			A13	6.9				
			A14	5.5				
3/60	8.0M	20/400	A15	4.4			20D	
			A16	3.5				
			A17	2.8				
			A18	2.3				
			A19	1.8				
1/60		3/200	A20	1.4				

The Functional Assessment

4

For the person with partial sight, the first step is to have a functional assessment.

The assessment of the low vision patient is done to ascertain the level of the vision available to an individual, and how he uses it to perform his daily tasks. A thorough understanding of his vision and demands can help the professional assist him in advising and deciding for the type of optical and non optical aid to be prescribed.

EVALUATING WHO CAN BENEFIT?

During the examination, the low vision examiner should take a detailed history and ask questions about the individual's functional problems. Also investigate any physical limitations the person may have, which might interfere with the use of certain types of devices.

Then administer a series of tests to evaluate the patient's visual function, including visual acuity, visual fields (central and peripheral), contrast sensitivity and color vision. The information obtained from this testing will provide clues about whether devices may be beneficial and, if so, what types of technology to prescribe.

The examination for low vision patient is performed by an eye specialist and an optometrist together, where both work on the patient in understanding his pathology and other in assessing his visual needs.

Assessment of Needs of Visually Disabled Patient

Performing all activities like a normal person may not be possible for low vision patient, however finding the right

combination of visual and non visual devices can enhance the quality of life and give some independence to the patient.

Most Common Needs of Such Patients are:

- Reading or writing
- House keeping financial management
- Signing
- Distance or TV watching disabilities
- Leisure activities
- Changes in light levels
- Night travel
- Depth perception
- Freedom from glare
- Recognizing faces and objects
- Mobility in unfamiliar areas etc.

These desires of low vision patients can mostly be easily tackled. Though these may or may not be specified by some patients, so a series of questions need to be asked to understand his needs.

DISTANCE VISION NEEDS AND EXPECTATIONS (Fig. 4.1)

A low vision examination, often the first step in vision rehabilitation, is designed to accurately measure how one's vision works in the real world - how it functions in day-to-day living. It's not only about how well you can see an eye chart, but also how well you can see faces, street signs, Television or blackboard in the school and all the other visual clues that guide them through the day. Perhaps distance vision is the need and an expectation of every patient. One has to understand his possible day to day activities and how distance devices have to be adviced so that they are utilised.

Near Vision Requirements

Patient will have to be asked specific questions about his vision. The purpose is to determine how people can cope with near tasks.

Fig. 4.1: Closer to read blackboard

Specific questions will have to be asked to assess this. These will also depend on *patient's literacy level*. So it is important to begin taking history after judging his literacy skills. Very often the patients referred for low vision prescription are illiterates and have no concern for reading and writing. Their requirements are very much different from the literate ones.

Other factors which can affect this decision are reading speed, tiredness (fatigue) from reading, availability of spectacles and low vision devices, and availability of print or Braille materials. Distance visual acuity should not be used to decide on the best type of reading device.

The near vision test needs concentration for only a short time. Some tasks may require concentration on near objects for a long time. This may cause tiredness and fatigue can affect vision.

Reading Disability

Reading a book is most desired by all students and working people. They depend on others or relatives to help them read books to them.

Most of the elderly rural population of our country are the one's who have not had access to school, or some have very little reading ability or needs. Where as most of the literate elderly have inability to read as their major concern. It is common to find ARMD in this age group, who find themselves as "disilliterate" now. They want to spend most of their time reading and improving this is very much possible in many with optical aids or speech output devices.

Writing Disability (Fig. 4.2)

Writing ability is maintained by most of them, but reading their own handwritten documents is not possible, so they lose the wish to write also. Patients especially students may specify that they can write but the speed may be slow or cannot maintain their writing in straight lines. Some may complain of bending too close while writing, which may lead to fatigue.

Fig. 4.2: Bends closer to write

Daily Activities

In order to benefit from the low vision devices you may ask about the kinds of activities he/she does on a regular basis. Here are a few examples:

Daily Living

Personal care, reading mail, writing checks, telling time, identifying money, preparing meals, and identifying and measuring medications.

Traveling

Identifying addresses and street signs, crossing streets safely and using public transportation.

Leisure

Reading books, watching TV, playing cards, doing crossword puzzles, knitting and using a computer (Fig. 4.3).

Fig. 4.3: Sits closer to watch TV

Lighting Needs

Patients should be asked specific questions to understand what advice has to be given regarding his lighting needs. Does one have difficulty seeing under different lighting conditions? This refers to either natural or artificial light and. The amount and direction of light are important for best visual functioning. People have different needs for lighting, but generally good light is best. Some may prefer a bulb and some fluorescent tube light. Does the person work better in bright light or in the shade?

Inside, can the person work better where there is light from a door or window?

Is there any difference in how the person can move around when it is dark, compared with in the light.

Glare Problems

Is he affected by glare—outdoors, indoors or both? Does he have difficulty seeing under different lighting conditions? Does he see better on sunny days or cloudy days? Does the person try to shade the eyes with a hat or a hand or turn from the sun?

Contrast

How does he describe his disability to see contrast, such as a light gray sweater lying on a white bedspread, Drinking milk in a white cup or reading print that is not so dark like in the the bank pass books.

Field Defects

Are there any blurred or distorted areas in his vision? Where are they? Does he see better when he looks slightly away from the object? Can he see the objects on either side? These are some of the questions which can estimate if there is any defect in the visual field area.

Mobility and Orientation

Do you travel independently? Is ther any problem in moving independently outdoors or indoors? The pupose is to know about visual functioning related to orientation and mobility and bumping into objects. Ask to determine his mobility status indoors and outdoors. Also how the patient is able to distinguish objects when looking directly, off to the side, above and below an object. Does the person move in a restricted, small area or move freely throughout the whole area of the village or town.

Color

The correct use or knowledge of colour is important in some situations. Choosing and matching colors are important in some house hold tasks.

Occupational Needs

It is the use of vision for particular purposes to carry out everyday activities at his work place.

Give enough time to each patient asking each one of these questions. More the time utilized in low vision work up in evaluating his needs and understanding his problems greater will be the chances of success. The rest will be very easy to tackle.

The Examination and Evaluation

5

After taking a detail history of his needs and complaints the low vision specialist has to start the assessment and perform the following tests to ultimately decide on the optical/ non optical devices one has to use to benefit him. The complaint also gives you an idea of his motivation and his psychology in accepting the devices.

Visual Acuity

The visual assessment starts when the patient enters your clinic. Observe his mobility and the residual visual acuity. Record the information about patient's ability to discriminate details at all distances.

While recording vision note that a long standing Low vision case/child may not be familiar with words or alphabets. They may present difficulty in assessing visual acuity. Be sure about this.

Decreased visual acuity generally indicates greater need for magnification.

DISTANCE VISION

The examination begins with distance visual acuity (DVA) is tested to gain an understanding of the degree of vision loss. It does not indicate how well a person uses vision but is a standard measurement. Vision loss can be described in the following categories (Table 5.1).

Table 5.1: Categories of vision loss

Amount of visual loss	*Visual acuity*
None to slight	6/6 - 6/18
Moderate	< 6/18 - 6/60
Severe	< 6/60 - 3/60
Profound	< 3/60

Vision Recording (Figs 5.1 to 5.3)

The patient is asked to read *specially designed charts.*

Record vision unaided, then best corrected, uniocularly and then binocularly. ETDRS (Early Treatment Diabetic Retinopathy Study) charts are recommended for accuracy and reproducibility. These charts are calibrated for 2 m or 4 m and some specially made for Low vision evaluation. Low vision

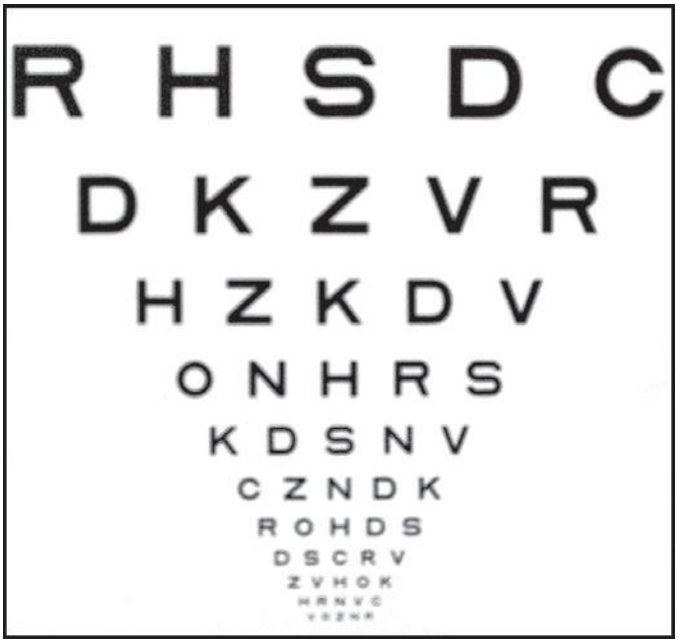


Fig. 5.1: Logrithmic visual acuity chart

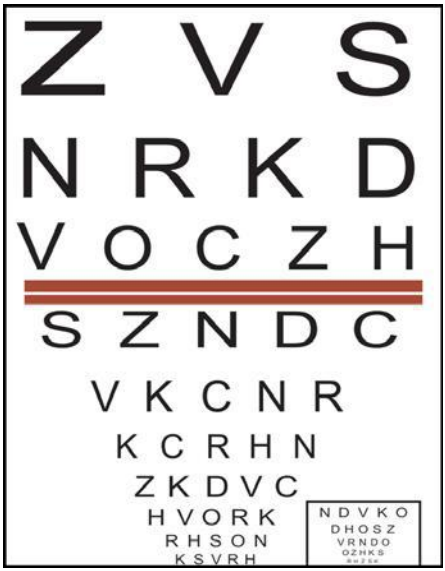


Fig. 5.2: Acuity measuring chart

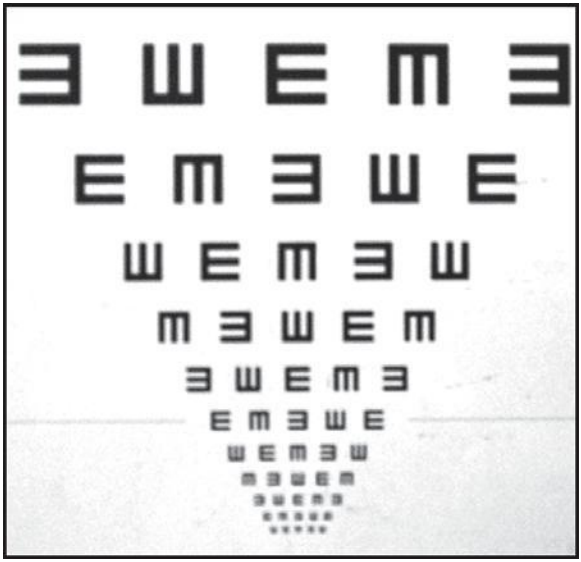


Fig. 5.3: Illiterate chart

evaluation should be done at less than 6 meter distance, depending on the patients distance visual acuity. Recording vision as counting fingers is not accurate and never standard. Patients also feel satisfied to see some lines on charts at close distance rather than felling depressed, on never been able to read the 6 meter visual acuity charts whenever they came for an ophthalmological examination.

These charts have Sloan types which have corresponding vision of Snellen's recorded on the side. Conventional Snellen's charts are also misleading in vision in the critical range of 6/60 or 6/36 p. The first letter can easily be guessed even if blur.

Projector charts are not recommended as they have reduced contrast between letters and the background. Also most of Low vision patients suffer from glare which hampers the actual vision recording by projection charts.

NEAR VISION

The purpose in testing near vision is to determine how people can cope with near tasks.

The results of a near vision test show a person's ability to see the details of near objects (within arm's distance from the body). The results of the test will give an idea of the detail that can be discriminated. Near tasks include craft and leisure activities, eating, personal care and hygiene, writing and reading.

The information from a test of near vision can help in making decisions about whether normal print, large print, low vision devices or Braille will be best for a person. The results of the near vision test are not the only information needed to make such a decision.

Near Vision Recording (Fig. 5.4)

Near vision is recorded with presbyobic correction worn (in case of presbyobic patient and visual acuity chart held at 40 cm (16 inches), both monocular and binocularly. For a non

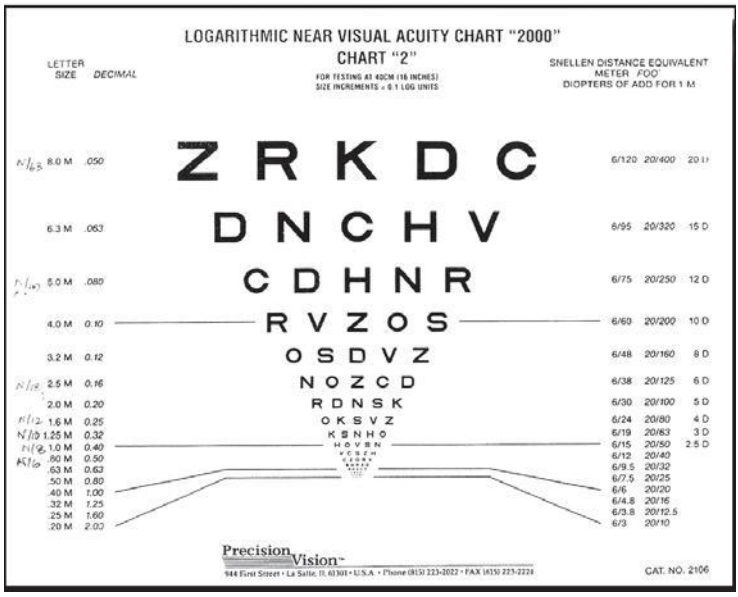


Fig. 5.4: Near vision recording charts

presbyobic patient record visual acuity with the best corrected distance glasses.

Special reading charts - Log MAR with single letter and continuous ones are used for recording near vision.

These charts serve two purposes.

1. They record near visual acuity
2. They serve as visual base for calculation of the power of low vision.
3. These charts also have large size words with very low near visual acuity

A patient with low vision will prefer to hold the book closer than 33 cm to read fluently. Basically because the size of the retinal image increases as the print is brought closer.

The **main purpose** of recording vision with these charts is to calculate the diopter value required for magnification for that particular patient. which has been discussed earlier.

To simplify this charts for near (Light house, keeler or sloans) has columns of precalculated adds for every possible visual acuity.

REFRACTION

The basic step of retinoscopy has to be performed using any method. If media is not clear retinoscopy is done at closer distance may be 25 cm or 50 cm. If so this type of retinoscopy is referred as radical retinoscopy. Remember to subtract for the working distance accordingly. Some guidelines while dealing with low vision patients are as follows:

1. Phoropters are not advisable.
2. The system of trial lenses and trial frames works better as the patients with defective fields can use eccentric head or eye positions to read the chart. Still better are the large aperture full frame trial lenses set.
3. Retinoscopy is important as subjective evaluation is usually not dependable.
4. Objective readings help a great deal and avoid wastage of time in subjective assessment. The retinoscopy may not be

extensive and small cylindrical errors prescriptions may better be avoided.

5. Auto-refraction is also a useful guide.
6. Sometimes old prescription may be used as a guide to start and refine in cases where retinoscopy is not clear or possible.
7. Assessment is done monocular and binocularly.
8. Comparison of vision should be made with old glasses binocularly. It is not wise to give a new prescription until the patient feels satisfied of improvement with the correction, or else comparative improvement with his old glasses. Ask the patient to see the face and the objects in the room and satisfy himself while comparing.
9. While refining spherical and cylindrical corrections, do so in steps depending on the visual acuity. A 3/60 patient will not be able to appreciate differences of even 0.50 steps and a 6/60 may be unable to decide with 0.25 steps (Fig. 5.5).

Fig. 5.5: Acceptance over old glasses—Helberg clips

10. Cross cylinders can be used for subjective testing. The cross cylinder should be of large denomination.
11. Prisms can be tried in patients with central scotoma to displace the image on to the better functioning area of retina.

Standard distance refractive correction with spectacles or contact lenses will enhance the visual function in many.

ADDITIONAL VISUAL FUNCTION TESTS

Visual acuity is not the only indicator of visual function. The other tests which complete the visual performance status are Field charting, Contrast sensitivity and Glare test. These tests are modified for low vision. These tests save a lot of time in understanding the prognosis of the low vision devices tried.

Visual Field

This test should be done to almost all patients. An Amsler chart is used for central scotoma patients and the Goldman's perimeter for peripheral field of vision.

A Goldman perimeter is the best way to estimate the field defect and classify the peripheral defects. The perimetry report indicates the extent of the scotoma, their position and density. Peripheral field defects are found in commonly in glaucoma, retinitis pigmentosa patients. Automated perimeters though more accurate, seldom reveal the true threshold values, due to poor fixation and visual acuity.

The central scotoma will explain the ability of the patient as to why he is able or unable to read the text. Central scotoma the larger they are, the more the magnification is needed and difficult to achieve 1 M visual acuity. If the scotoma is to the side of the fixation target it becomes easier to achieve the visual acuity. The Amsler grid (Fig. 5.6) should always be at hand and presented to all patients on routine. The recording of the scotoma also forms a base or guide for the follow-up visits. Some central scotoma patients will fix eccentrically, this is a healthier sign as the eccentric fixation developed indicates better prognosis. Central field loss often indicates difficulty with visual

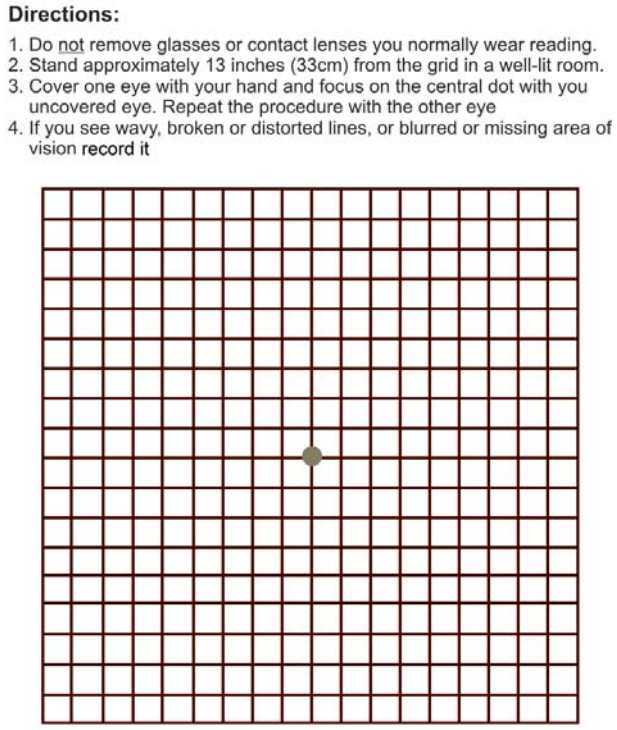


Fig. 5.6: Amsler grid eye exam

skills for reading, whereas peripheral field loss often indicates difficulty in mobility.

(The position and the extent of the scotoma affect the prognosis and manifestations of patient's complaints- e.g. a dense scotoma to the right of fixation may cause portions of words to disappear. A scotoma below may lead to problem of finding the beginning of the line of the text. A very dense large scotoma may show no improvement with devices. Such details have been discussed further in the visual field chapter.)

Contrast Sensitivity Function (Fig. 5.7)

This test is done to assess patient's ability to appreciate contrast. Contrast acuity contributes a lot to patient's problems. Some

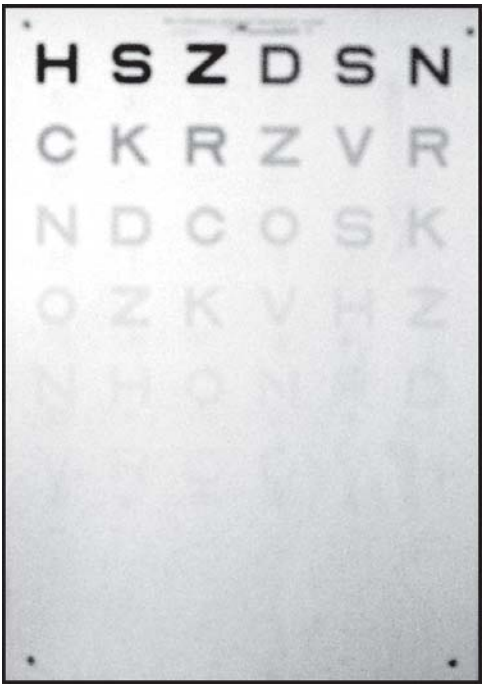


Fig. 5.7: Contrast acuity

will be able to perceive black print on white paper but may find it extremely difficult to pour milk in white cup. Some may find contrast variations due to surrounding illumination.

A contrast sensitivity test is done with a Low Vision contrast sensitivity chart specially made for 1 meter recording.

If the contrast acuity is low

1. Higher than expected adds/magnifications are required.
2. Very poor contrast acuity patients may turn out to be dissatisfied ones.
3. They will need higher illumination
4. May need typoscope or absorptive filters.

Glare Test

Some Low Vision patients suffer from glare most often seen in pathologies like albinism, cataract, posterior capsule

opacification, aniridia, corneal edema or opacities, Glaucoma, lasered diabetic retinopathy patients etc. Glare signifies the need to add filters or contrast enhancers in the distance glasses to improve their distance vision. A simple advice of Cap works wonders in many.

Testing of glare disability can be done by following methods:

1. Some estimation can be made by patients' complaints.
2. Measure patient's visual acuity both with and without illumination in vision charts. A reduction on illuminated chart suggests Glare problem.
3. Make the patient read the chart, while he or she is reading simulate a light source may be by torch or retinoscopy light into the eye. A reduction will indicate Glare disability.
4. The more standard method is by glare acuity tester.
5. Glare acuity tests are mostly available on Auto refractors.

Color Vision (Fig. 5.8)

A person's color vision can be assessed by checking if differences in colour can be identified.

Collect different colored threads, material or objects like buttons spread the objects out in front of the person on a plain table or mat. He can move as close as he wants to the objects. Ask him to discriminate, match or sort out colors.

Good or Preferred Eye

Before presenting the devices it is advised to decide which of the two eyes is the better or the preferred eye. Very rarely the visual acuities are equal in both eyes. Often one eye has better visual acuity which *should be the examiners target in correcting.*

Past Low Vision Device Used

Before staring the trial of low vision devices record the visual acuity and performance of the devices the patient is using. Discuss the benefits and the satisfaction level of the devices

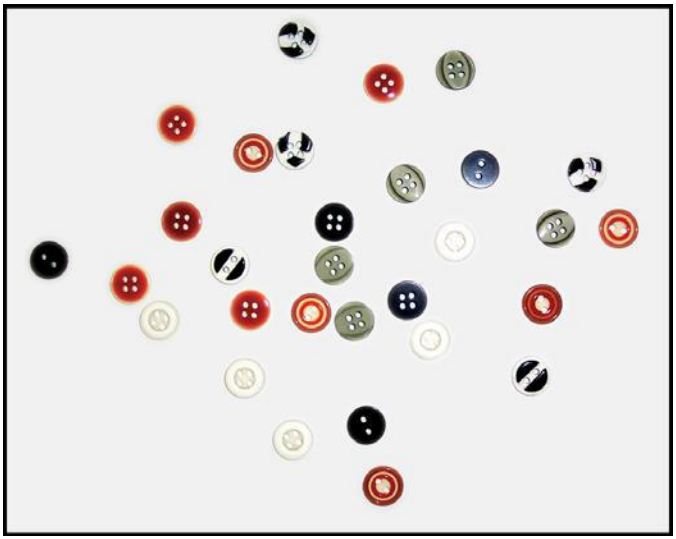


Fig. 5.8: Color vision—matching buttons

used. Their expectation low vision and particular demands will help you start the work up.

WORK UP—SUMMARY

To summarize work up I suggest that the evaluation is tackled in the following steps. A sample of the work up form is also shown later, which will guide you the order in which the patient should be evaluated.

Low Vision Aid Assessment and Evaluation: Record in Following Order

1. Gathering personal information — will include name age, address, family members, family income, current profession, and current academic stars.
2. Information about the eye disorder — cause, time of onset, family history.

3. Details of the complaints from distance vision problem , near vision handicaps, lighting needs, glare problem, mobility problems all functional vision check list.
4. Visual acuity – Snellen's, Log MAR charts, or any other specific chart, near visual acuity.
5. Previous refraction/power of glasses.
6. Refraction and acceptance — check if binocular better and compare with previous glasses.
7. Specify the good eye.
8. Contrast sensitivity testing.
9. Visual field charting-Goldman or Amsler.
10. Previous low vision device information, has any test been done earlier, findings, low vision device prescribed, reasons for success and failure of the device last used.
11. Glare acuity.
12. Proceed for trial of optical devices. For near and distance, record the improvement and write remarks about its acceptance or failure.
13. Advise non-optical aids on the basis of personal needs.
14. Final prescription.
15. Vision accomplished or not. If not, refer for rehabilitation services.
16. Next follow-up date. *Follow-up and keep track of his adding needs, his satisfaction and dissatisfaction.*

LOW VISION EVALUATION FORM—SAMPLE

Name	Date

Age	LVA No.
Sex	OPD No.
Address	Occupation / educational level

Diagnosis:

History of disorder:

Chief Visual complaints:

DV problems	Blackboard	Seeing Faces	Watching TV	Bus No
NV problems	Specify ….	Needs?		
Lighting Needs	Dim	Bright	Fluorescent tube	Incan-descent bulb
Writing task	Cannot sign	Cannot write	Straight lines	
Mobility problem	Yes	No	Indoors	Outdoors
Glare problems	Bright light	Sun light	Car light	
Colour perception	Yes	No	Unknown	
Living skills	Coin identify	Food identify		
Any Other				

Visual Acuity Assessment

DISTANCE Visual Acuity	**OD**	**OS**	Binocular
Snellen's chart OR – unaided			
(OTHER TYPE) glasses			
Log MAR charts - unaided			
distance - with glasses			
NEAR	**OD**	**OS**	
Single letter			
Continuous Charts			

Retinoscopy	Present Prescription:
RE :	RE:
LE:	LE:
ADD:	ADD; Lens type:

Preferential looking test	Contrast visual acuity
Binocularity	Glare Visual field assessment

LOW VISION EVALUATION

Current aid used	Remarks	OD – vision	OS – vision

Trial—Distance	**OD**	**OS**
Telescopes- type?		
Pin Hole Spectacles		
Filters/ Tints/ CS enhancers		

Near—LVA—Trial

	Power	OD	OS
High Plus Add			
Hand magnifier			
Stand magnifier			
Telescope- near			
Self-illuminating magnifier			
Electronic device/ CCTV			
Any other specify			

Nonoptical AIDS:

	Yes	No
Reading table		
Reading lamp		
Signature guide		
Letter writer		
Reading guide/typoscope		
Large print books/notebooks/		
Notex		
Assistive technology device		
Any other		

Prescription:
Distance ———————————————————————
———————————————————————
Near ———————————————————————
———————————————————————
Visual objectives accomplished Yes/No ———————
Rehabilitation plan ———————————————————
Next follow-up date: ———————————————————

———————————————————
Signature/Name/Designation

Optical Devices

6

Optical devices are of two kinds:

- Near
- Distance.

Near devices are designed for magnifying close objects and print. Distance devices are for magnifying things in the distance (from about 3 meters to far away).

Various types of optical devices are as follows:

MAGNIFYING SPECTACLES (High Plus Reading Glasses) (Fig. 6.1)

Normally, the spectacles can be prescribed near add up to +3.50 Dsph. Anything higher than this is called high plus add lens. In these magnifying reading glasses High plus additions are given in spectacle form. Higher the addition, closer becomes the reading distance. This is also calculated from the simple formula of 100 divided by add, e.g. + 20 Add will have a reading distance of 100/20 = 5 cm.

These are easily available and trial set lenses can be used to prescribe them.

The spectacle worn will produce an approximate magnification of 1/4 rth of the power of the lens. So, a +20.0 D lens will act as +20.0/4 = 5 X magnification. This may not be true for all as some manufacturers may not follow it.

Uses

- For reading any material
- Writing
- Looking at objects from close range.

Fig. 6.1: Magnifying glasses fulframe or half eye

The various forms of these low vision spectacles are: (Figs 6.2 to 6.4)

1. ***Where binocular corrections are needed*** **– Prism spectacles, half eyes or full field.** Powers usually available are +4.0, +5.0, +6.0, +10.0, and 12.0. Base in prisms are added to compensate for the convergence angle of the eye and facilitate binocularity.

Fig. 6.2: Magnifying glasses with base—in prisms

Fig. 6.3: Magnifying glass

Fig. 6.4: Base in prisms for binocularity

Binocularity with high plus additions:

It is commonly seen that binocularity is absent in most of the low vision patients. Usually one eye is the preferred eye and the other suppressed. Yet we come across many cases, specially the ones with lesser degree of impairment who may need binocular near additions. To compensate for the

convergence for near, prisms are incorporated. The rule is – 1 prism Diopter of base in prism is incorporated for each diopter of reading addition. So, if a +5.0 Diopter reading lens is required a 5 D. Base in prism is incorporated into each lens.

2. ***Where monocular corrections are needed*—Hi plus aspheric spectacles**
   Powers like from as low as 4.0 Diopters to +10.0, +12.0, +14.0, +16.0, +20.0, and 24.0. These are made by simple plastic material lenses. The design should be aspheric preferably, to prevent peripheral distortions and enhance field of vision. The good or the better eye is corrected with the suitable power. The other eye can be prescribed a balance or a Plano lens.

Optical Quality of the Type of Lens to be Used (Fig. 6.5)

1. It should be preferably an aspheric design to eliminate peripheral aberration and provide reasonable field.
2. Plastic lenses — high index lenses give the advantage of reducing thickness and weight as compared to the glass
3. Fienblooms doublet design provide wider field than aspheric lenses
4. Antireflection coatings help eliminate unwanted reflections from lenses and increases light transmission.
5. Spectacle lenses are available upto +24.0 D powers; special high powered ones are available with some manufacturers.

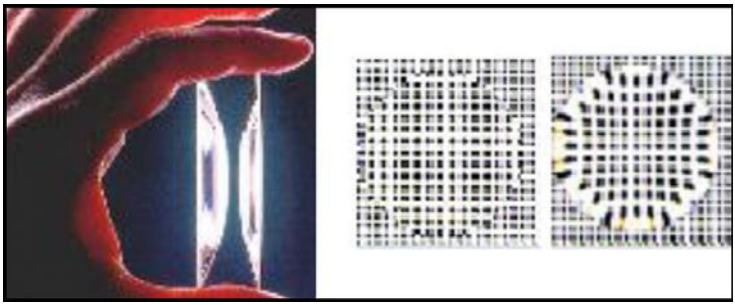


Fig. 6.5: Aspheric lenses are thinner, and have reduced peripheral distortions

How to Prescribe Them?

Let us remember that 4 Diopters is equal to one x magnification. The reading glasses will have higher plus additions given accordingly as **an addition over the distance correction**.

Suppose a patients distance prescription is +2 D Dsph, the near prescription after + 8 add will therefore be + 10.0 Dsph. Similarly if the Distance prescription is -2.0 Dsph the near power after +8.0 add will be + 6.0 Dsph.

Cylinder unless significant is ignored in such glasses.

Also remember that the **patient has to read at the focal point** according to the addition. That is if the reading glasses have 10 addition, the reading distance becomes 100/10 = 10 cm and if the reading add is +5 the reading distance becomes 100/5 = 20 cm. So, the patient should be advised to *go closer as the adds are increased*. This is the major limitation of this device, which can be overcome to some extent by advising a slant reading table along with it.

After the Dioptric power has been calculated a lens of that power is placed over distance correction. For example if the distance prescription is + 1.0 D sph/–2.0D cyl axis 90 and the required add is + 10.0. The final near correction becomes + 11.0 Dsph/–2.0 D cyl axis 90. The patient is asked to read the near vision test chart to record the target vision required.

Image Quality with Reading Spectacles

The magnified image will be only as good as the quality of the original image though enlarged. That is an irregular, distorted image from macular disease though still irregular and distorted, becomes more readable. However, stronger magnification results in narrower field of view. Also the magnification reduces the contrast which further restricts the magnification upto which it can be enlarged.

Advantages

- The hands are free to hold the reading material
- The field of view is larger compared to telescopes and some stand magnifiers

- Reading can be done for a prolonged time than hand magnifiers and stand magnifiers which tire the hands soon
- They can be given in both monocular and binocular form
- They are easily portable
- They are the most acceptable form of low vision device as it does not show much of patient's disability to everyone.

Disadvantages

- The major problem of this device is the fixed close reading distance, and higher the add closer is the reading distance
- The close reading distance causes fatigue or unacceptable posture to read
- Illumination is obstructed and reduced due to bending over the book
- Patients with eccentric fixation are unable to fix through these glasses at times so may not have enhanced vision with them
- These may not be also effective in patients with constricted field of vision.

Bifocals in High Additions

Standard bifocal corrections usually do not exceed 4 Diopters. However strong bifocal additions of +18.0, +32.0 are available from univision or Benjamin franklin design.

Standard bifocal additions beyond 10 Diopters are usually not easily tolerated.

MAGNIFIERS

There are almost infinite numbers of magnifiers available. They all have one property in common – they are designed to be held close to the reading material to enlarge the image of the print to make it more readable. Some have battery operated or plug in lights built in which can be of value. The amount of magnification is dependent upon the a*mount of remaining vision* and the *size of the material* to be seen.

Magnifiers for near tasks can be **used for:**

- reading a book or a newspaper
- reading labels, signs or prices in shops
- using tools, for example measuring
- identifying money

Remember the formula: Multiply the amount of magnification by 4 to get the "Dioptric Power" of the lens. Divide the Dioptric power into the number 40 to get the number of inches from the eye.

HAND MAGNIFIERS (Fig. 6.6)

These are plus lenses that are held in front of the spectacle plane. They can be used with or without glasses.

Uses

- Reading signs, labels, prices, books
- Identifying money
- Viewing near objects.

Fig. 6.6: Hand magnifiers

Hand magnifiers are available from +4.0 to + 68.0 Diopter. The quality of the lens is very poor and degraded after +32.0 Diopters. Also higher the power smaller is the lens size of the magnifier and hence reduced field of vision. The field of view depends on the distance of lens from the eye and the size of the magnifier.

The practitioner can stock single manufacturers or tend to select a few designs and powers from each manufacturer. Each has a special feature, the design, some with wider field of view, some are lighter, and some are pocket folding models or may have self contained illumination. The illuminated ones give an advantage of using them wherever the room or the surrounding light is dim.

The hand magnifiers are available in 3 basic designs (Fig. 6.7)

- Aspheric,
- Aplanatic, and
- Biaspheric.

Fig. 6.7: Hand magnifier

The trial set should include following ranges of magnifiers – 2X (8 Diopters) to 10X (40 Diopters). Most patients accept up to 6X magnification depending on task and degree of impairment. The image is viewed with distance vision glasses or through reading glasses in presbyopes.

The trial procedure includes starting with magnifiers from less magnification to higher gradually. Giving time to patient to read with each, to the one he feels most comfortable to hold and read. Some may prefer less magnification but larger field of view, some may prefer folding shapes, and some want very strong powers to enable them to read the smallest. The selection depends on the patient's requirements and the task he wants it for.

Advantages

- The eye to lens distance can be varied with hand magnifiers
- The patient can maintain normal reading distance unlike spectacles and stand magnifiers which make the patient go close
- It is most convenient for short term tasks
- Many of our elder patients may have picked them over the counters and will be familiar to them.
- They are easily available
- They work well in patients with eccentric viewing
- Diseases with constricted fields will also benefit with them
- Some magnifiers have their own light source which itself enhances the vision.

Disadvantages

- The major one being that it occupies both hands hence is fair enough for reading but cannot be utilized for writing, or tasks which need the other hand free.
- Maintaining focus is also a problem in some, especially in elderly with tremors and poor manual dexterity
- The field of vision is also limited while using this device.

Optical Design of the Magnifiers Used as Low Vision Device (Fig. 6.8)

1. They can be spherical, aspheric, biaspheric and doublet.
2. They can also be illuminated or non illuminated form.
3. Higher the power the better is the optical quality required. Spherical magnifiers are cheaper ones. Higher the powers poorer will be the optics of the lens because of all types of possible aberrations a lens can have.
4. Aspheric lens has advantage or reducing thickness and peripheral distortions.
5. Biaspheric magnifiers have advantage of eliminating aberrations from both the surfaces.
6. Aplanatic or doublet magnifiers give a flat and wide distortion free field and good edge to edge clarity.

Fig. 6.8: Higher power smaller field of view

STAND MAGNIFIERS (Fig. 6.9)

Stand –mounted magnifiers may be technically simpler for the patient to use than the hand magnifier because they are pre focused and rest on the rigid mount. Illuminated magnifiers have an added advantage of non glare light source. Stand magnifiers range from 2X to 20X. The patient needs to place the stand magnifier on the reading material and move across the page to read. A reading stand is recommended with this kind of magnifier. The presbyopes should read with his reading glasses.

They are a choice for patients with constricted or central field loss.

Uses

- Reading from a book or newspaper
- Looking at a picture or diagram.

Advantages

- It has a fixed focus easy for patient to see through
- It works good for patients with tremors, arthritis and constricted fields
- They may have their own light source.

Fig. 6.9: Stand magnifier

Disadvantages

- The field of view is reduced
- It required good hand coordination
- Too close to reading posture is sometimes painful for long hours.

Optical Quality of the Stand Magnifier

It has to have the same properties as hand magnifier lenses.

TELESCOPES (Fig. 6.10)

Telescopes have a small but an important place in low vision. Telescopic systems magnify the apparent size of the distant objects making them appear closer to the patient than they actually are.

Binoculars magnify distant objects. Binoculars placed into eyeglass frames are called telescopic spectacles. They can be

Fig. 6.10: Spectacle mounted telescopes, uniocular, binocular

monocular (one eye) or binocular. The telescope can be placed in various positions:

- Telescopes with magnification powers from 2X to 10X are prescribed. They are prescribed for distance, near and intermediate tasks. The patient has to spot the object he wishes to see and then brings the telescope from the side to the eye.

  They are generally used for:
  - Signs
  - Finding and recognizing people or animals
  - Reading from a blackboard in school. Reading from a blackboard from a distance > 2 m
  - Finding an entrance to a building
  - Watching games
  - Looking at objects you cannot get close to, e.g. top of a tree, animals
  - Traffic signals, street signs bus numbers
  - Television
  - Or reading at normal distance etc.

Types of Telescopes Include

1. Hand held monocular (Fig. 6.11)
2. Clip-on, spectacle mounted, monocular or binocular
3. Bioptic designs.

Fig. 6.11: Hand-held monocular telescope

The optics is based on two principles:

- Galilean
- Keplerian.

Galilean or Keplerian Telescopes

These are the two basic designs based on the principle of angular magnification. The main difference is:

	Galilean telescope	*Keplerian telescope*
1.	The eye piece is negative lens and the objective is a positive lens.	Both the eye piece and the objective are positive lens
2.	Resultant image is virtual and erect	Resultant image is real and inverted. Prisms are incorporated to erect the image
3.	Loss of light reduces the brightness of the image to some extend	Loss of light is more in this system so there is a greater loss of brightness in this system. (Efficiency may be reduced further in conditions like RP, Glaucoma, and ARMD etc.)
4.	Field quality is relatively poor	Field quality is relatively good

There are four types:

1. **Regular field—**a "Galilean" system available as fixed focus or variable focus.
2. **Wide angle—**a "Galilean" system available only as fixed focus.
3. **Expanded field—**a "Keplerian" variable focus system.
4. **Micro-spiral—**a "Galilean" variable focus system.

- Magnification and field of vision Telescopes vary in power from 1.7 to 8.0X.
- Field of view decreases with power.
- Field of view also varies with design of the telescope Higher the magnification lesser is the field of vision. This limits the level of magnification one can go upto, e.g. A 3X telescopes gives 12.5 degrees of field and a 4X telescope gives only 10 degrees of field of vision.

- The trial should be done on the better eye.
- Children can be prescribed a spectacle mounted telescope, both uniocular or binocular.

Advantages

- It is the only possible device to date which enhances distance vision
- Can be used in a classroom for blackboard reading or outdoors.

Disadvantages

- The major drawback with telescope is the restriction in field of view
- The second is the appearance and the apprehension
- Patients with constricted fields do not benefit much by them
- The focusing requires coordination of hands and eye, which is sometimes difficult for the patient to focus
- They are usually expensive and costly for many of our patients.

Bioptic Telescopes (Fig. 6.12)

A bioptic telescope is a system where the telescope is attached to the top of a pair of eyeglasses, which allows the wearer to switch their sight between their "regular vision" and the magnified vision of the device by just a slight tilt of the head, similar to how one uses a bifocal.

Fig. 6.12: Ocutech bioptic telescopes the VES® autofocus, the VES®-K

Magnifiers for Specific Needs and Demands
(Figs 6.13 to 6.15)

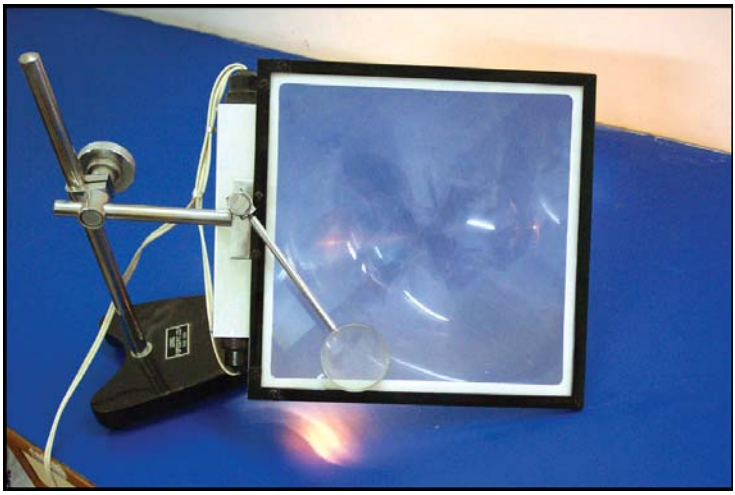


Fig. 6.13: Various other types

Fig. 6.14: Various other types of magnifiers

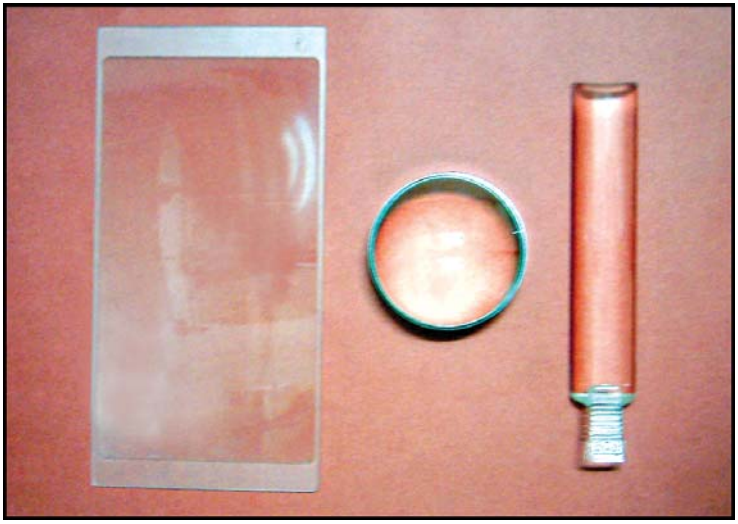


Fig. 6.15: Bar reader, paperweight, fresnelbook magnifier

Telescopes for Near/Intermediate Tasks

Telescopes can also be prescribed for near and intermediate distances.

For near tasks they have an advantage over the reading spectacles – the reading distance is more with them compared to reading spectacles. The acceptance of these may be less due to its cumbersome looks and reduced field of vision.

Telescopes also have been used for intermediate tasks like computers.

Nonoptical Devices

7

These are aids other than lenses that may supplement optical lenses or can be used independently. They are items designed to promote independent living. They alter environmental perception through: **BBB –** Bigger, brighter and blacker, or

CCC – Closer, color, and contrast.

Thus, the function of a nonoptical device is to enhance the visibility of retinal image and optimize the use of magnifiers.

The following are **some examples** of nonoptical devices:

1. Reading lamp
2. Reading stand
3. Writing guide
4. Reading guide
5. Signature guide
6. Bold line note books and paper
7. Black ink bold tip pens
8. Soft lead pencil — 2B, 4B, 6B etc
9. Needle threader
10. Notex.

To advice on nonoptical devices there should be a range of these available for demonstrating and training the patient in their use.

Nonoptical Devices can be Grouped According to Their Function

1. Enhances the images and reduces glare
   - Typoscope
2. Enhances contrast
   - Felt-tipped pens
   - Good lighting on object or print

- Bold lined paper (Fig. 7.1)
- Writing guide

Adjusts or Provides a Comfortable Working Distance

- Reading stand

Changes to Environment

- Control or adjust light/glare with hat, eye shade or lamp, sunglasses
- Organize space with less clutter.

Lighting and the Reading Lamp

One should be taught to make lighting arrangements that will work best for him/her.

The brightest light intensity is possibly not the best always. It depends on the eye condition. Light intensity that is too great will result in excessive glare and makes the functioning more difficult. The best is trying various wattages with material that one normally would read and see what makes it easiest to read.

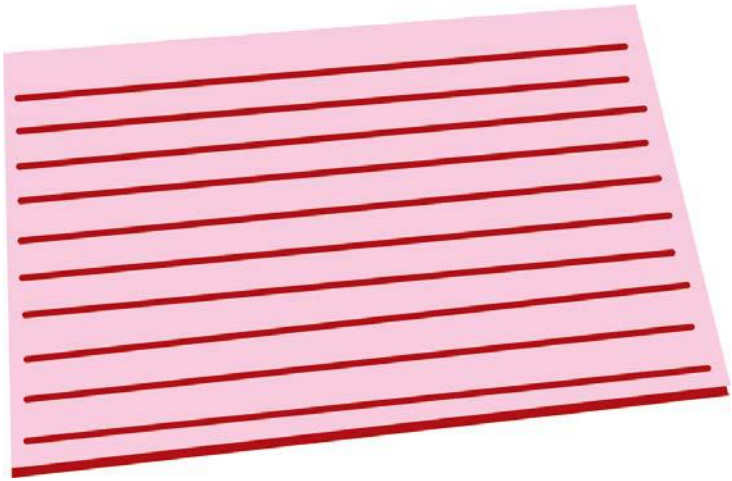


Fig. 7.1: Bold line paper

Patients with macular lesions will find bright or greater wattage better and those with cataract prefer medium light intensity, whereas the albinos will find it easier to read in lower wattage.

Enlarging the object or the print to patients viewing capacity by optical devices, lowers the contrast or the brightness of the image. This can be improved by increasing the illumination.

Visually impaired person mostly needs more light when reading to read to do tasks. This enhances the contrast. Simple advice on adding a lamp while reading enhances the visual performance. Many patients prefer to read in the natural day light.

The lamp should be along arm, adjustable, generally with 60 w incandescent or 11w fluorescent tube. It is not possible to decide at times the wattage patient will be comfortable with. The best option is to advice patient to try various wattages and see which makes it easiest to read.

The adjustable arm should let the light focus on the reading material and not towards the eye. The bulb is more focused light but is felt as warm and needs diffusers to reduce glare. The fluorescent tube is cool and better tolerated cataract, corneal opacities and corneal edema patients.

Illumination (Figs 7.2 and 7.3)

Various levels of illumination are tested. When strong illumination is required a gooseneck floor or table lamp is recommended. Illumination mathematics dictates that bringing the light source closer is much more effective than increasing the bulb strength.

A 50 watt bulb at 12 inches from the page is much brighter than a 300 watt bulb 3 feet from the page, and produces less heat.

All lamps are subject to filament decay over the period of time. The old and darkened bulbs should be replaced often.

Positioning of the light is important. The light source should be to the side of the better Seeing Eye. Moving the light closer will yield higher illuminace.

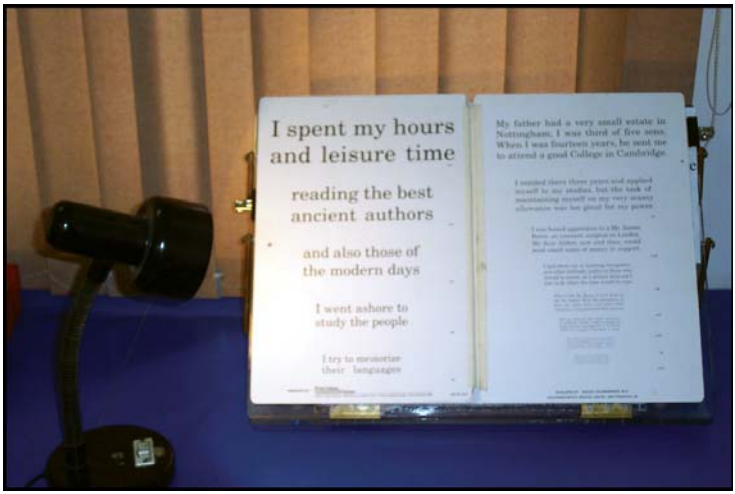


Fig. 7.2: Lamp with bright intensity and slant reading table

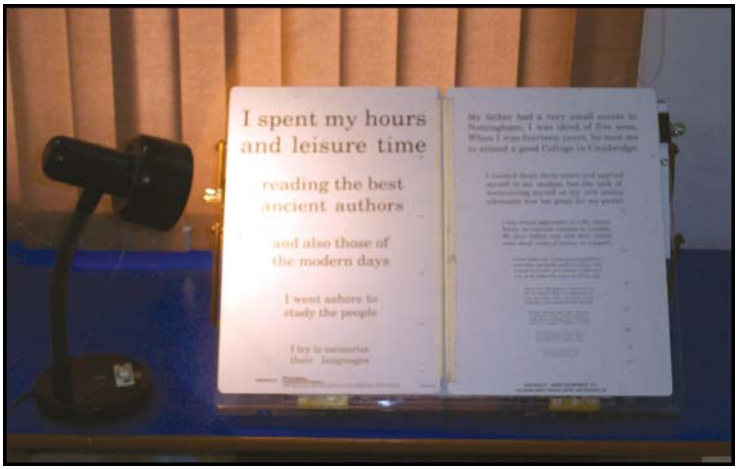


Fig. 7.3: Lamp with less intensity and slant reading table

Need for **higher levels of illumination** are seen in patients who have:

a. Lost cone functions, like in macular degeneration or ARMD
b. Damaged nerve fibers layers like in glaucoma
c. Diabetic retinopathy
d. Patients on miotics

e. Degenerative myopia
f. Chorioretinitis
g. Retinitis pigmentosa.

Eye diseases which require **reduced illumination** are:
a. Albinism
b. Aniridia
c. Corneal opacity
d Achromatopsia

Reading Stand (Fig. 7.4)

The most common prescription of low vision devices is the reading magnifying spectacles. As we know that the reading distance with these glasses is at the focal length of the glasses. So reading for long hours with them leads to postural strain and discomfort. Bending over the reading material to read also reduces illumination. So, to give an easy and comfortable posture the patient should be advised these slant reading tables.

We know that the magnification of the reading text can be increased if the reading text is brought closer to the eye. Most of the low vision patients are used to this. Also most of the

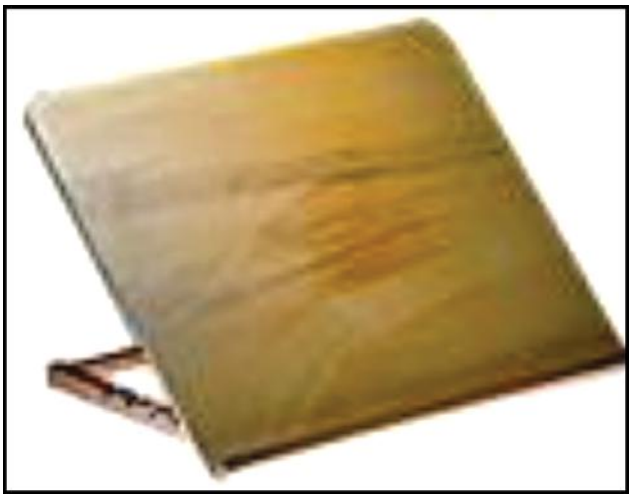


Fig. 7.4: A reading stand

optical devices like the stand magnifier, advised, needs close reading distance. The reading stand is thus a very useful and practical advice to the patient, *to provide comfortable body posture while reading at close distance.* The angle of the board should be adjustable by sliding the latch at the back.

Letter Writer/ Writing Guide (Fig. 7.5)

This is a black card with rectangular cut outs horizontally along the card at regular intervals. The writer opens like a book; between this the paper to write is placed. The patient with the help of the slots can feel the empty cut out spaces and write.

The set consists of different guides of durable material that will meet the needs of low vision customers. The set includes a check writing guide; business envelope guide, stationary size guide, full page letter guide and greeting card guide. Writing

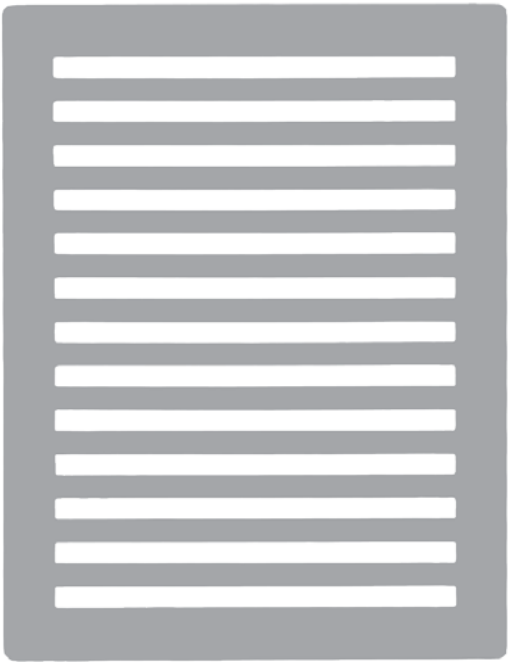


Fig. 7.5: Writing guide

Guides help people with low vision to *write neatly and maintain proper form.* These can be designed for someone's personal needs also. Some of the common ones prescribed are:

- *Letter writing guide:* for use on a standard sheet of paper or stationary.
- *Business envelope guide:* for use on standard business sized envelopes.
- *Regular envelope guide:* for use on standard sized envelopes like bills and cards.
- *Signature guide:* helpful when you need a little guidance when signing (Fig. 7.6).

Typoscope or the Reading Guide

It is a masking device with a line cut out from an opaque, non reflecting black plastic or thick paper.

It is a commonly use non optical aid to *reduce glare and control contrast.*

This is a reading guide which facilitates reading and improves speed by blocking glare from the page, as well as filter out the confusion caused by lines of print above and below the line being read. As the line is read you simply lower it. It can also be used for writing in straight line also. They should

Fig. 7.6: Signature guide

be available at all low vision clinics and can also be made at home from a simple black paper or board.

RELATIVE SIZE DEVICES

They are devices that work by means of relative size magnification or enlargement of an object. For a person with low vision, the larger object subtends a larger visual angle at the eye and is thus easier to resolve. When an object is not visible, its size may be increased to a point where it eventually exceeds the capacity of the viewer.

The following are its examples:

Large Print Materials

Large print books and reading materials enlarged up to 18 print sizes are readable by most of the low vision patients. Several magazines and text books are available around the world through publishers who do a noble work by printing them at around 18 font size compared to the general 9 point size.

Advising the patient to select them for reading is itself a low vision device. Many rehabilitation centers and blind schools offer text books in large print to help the partially sighted.

Patient can make their documents in large print themselves, by photocopy machines, or computer print outs. Though not practical at all times yet there may be occasions or texts which one has to read. The simplest way is to use a photocopying machine and magnify the print. The photocopy machine can magnify upto 150 percent of the original copy. This method can be expensive and produce copies with poor letter quality. Yet it can serve the purpose to some.

Some other simple and special devices under this category are:

1. Large type playing cards, crossword puzzles
2. Large number telephone dials
3. Enlarged print clocks and watches

Students and the Font Size

The magnification of print will depend on the grade or the class in which the student is. It is not necessary to prescribe the near vision print size of 1M level if the child is in nursery class. The best is to ask the child to get his school text books so that you can estimate the size of the print child needs to read. Many times no optical device may be needed at that particular age. The magnifications may be increased as the child moves to higher classes and the print size goes smaller.

Glare

Glare has been described as *unwanted light and where it should not be*. Glare is often disabling specially in cataracts, elderly, corneal opacities, albinos and even RP patients.

It can be aggravated by two common causes:

1. Reflection from bright and shining white maternal or
2. From light source which is too intense and direct.

Students just because of glare on the blackboard from window or overhead lights are unable to read. A simple instruction of avoiding this will make the things readable on the board.

A typoscope or the reading guide is an inexpensive way to bright or shining reading material. If too much glare persists changing the direction of light source or using dark glasses or filters will be helpful.

Absorptive Lenses

Absorptive lenses are lenses used to:

1. Enhance contrast.
2. Reduce glare.
3. Eliminate UV light.

There are conditions in eye which will benefit a lot by these lenses. Conditions like albinism, aniridia, corneal graft, RP, macular diseases will benefit by low transmission lenses. Some will have marked improvement in the quality of vision after enhancing their contrast by using contrast filters.

For most people, a pair of sunglasses is simply a nice item to have on hand for those times when it is convenient to cut down on the light, or glare, in their environment. This is because too much light, or glare, can have a detrimental impact on their visual acuity and their ability to function. And sometimes, especially for those with photophobia, too much light can be very painful.

Glare Reduction Lenses/Filters (Fig. 7.7)

Stray light, which is random in nature, interferes with visual resolution and hence reduces contrast in the retinal image. It is just like viewing TV in a well lit room or a dark room.

Conditions like albinism, aniridia, RP etc suffer a lot because of glare. Glare can be reduced in these conditions by giving Polaroid lenses. Or better still by Corning CPF series lenses or NoIR lenses. CPF lenses filter specific wavelength of blue light, including that generated by many fluorescent lights from the visible spectrum of light.

They are most effective in conditions like Diabetic retinopathy, macular degeneration, cataracts, and Retinitis

Fig. 7.7: Glare cutting filter

pigmentosa. Certain vision problems could be helped by eliminating certain wavelengths of light. For example, some individuals with retinitis pigmentosa have found that wearing sunglasses that block the transmission of the blue wavelengths of light helps to increase their visual acuity. During the evaluation one has to determine the most effective means of reducing glare for the patient along with the proper amount and type of illumination required.

Glare Control Devices and Filters

Filters of various colors and transmissions are tested for best response.

Examples:

- Gray, green or amber for ultraviolet sun protection.
- Orange/yellow lenses for increased contrast.
- Side shields and top shields for ambient/reflected light.
- Typoscope for page reflection glare.

Antireflection coating over the lenses increase light transmission upto 99 percent and reduce the reflections from the lens surface.

Contrast Enhancing Lenses/Filters (Fig. 7.8)

All low vision optical devices reduce contrast. There is a loss of 4 percent of light from each surface of the lens, resulting in an overall loss of 8 percent of light and hence reduction in contrast acuity.

Several contrast enhancing lenses are available in the market, e.g. corning, NoIR or Eschenbach lenses. These lenses generally attenuate most of the visible spectrum below a specific wavelength. They can be fit-over, clip-on, goggles, and non-fit-over fashion frames.

One can refer to the manufacturer's suggestions in prescribing these lenses.

Like for **corning lenses** it suggests: (response may vary depending upon pupil size, position of pupil and lighting conditions).

Fig. 7.8: Contrast enhancing filter

CPF 450 (yellow color)—for glaucoma patients
CPF 511 (yellow orange)—early cataracts
CPF 527 (orange)—for macular degeneration
CPF 550 (red)—for retinitis pigmentosa

Following are some of **NoIRs** filter colors,

The percentage figure given in the filter's title refers to the amount of visible light that is transmitted through the filter.

4 Percent Dark Plum—This is a very dark, general purpose filter that provides good contrast and glare reduction

20 Percent Medium Plum—they let 'in' a lot more light, so they are good in low light situations, and they can be comfortably worn indoors

2 Percent Dark Amber—particularly helpful on very bright days, 100 percent UV protection, 100 percent blue light protection, and 100 percent infrared protection.

40 Percent Light Amber—not only for protection from fluorescent lights, as well as other indoor lighting sources, comfortable when working on the computer.

58 Percent Light Grey—Relieves indoor glare, especially under fluorescent light.

32 Percent Medium Grey—For macular degeneration.

13 Percent Standard Grey—Good for postoperative cataract surgery, glaucoma sufferers, diabetics or people who have had corneal transplants.

65 Percent Yellow—Heightens contrast in retinitis pigmentosa, and macular degeneration.

49 Percent Orange—For sufferers of retinitis pigmentosa.

44 Percent Red—for achromatopsia or rod monochromasy.

Color and Contrast Enhancement (Fig. 7.9)

Color and contrast can be used to enhance patient's visual functions. Maximize contrast by using a light color against black or by dark color against light. Choose colors in the room or working area which have high contrast. Avoid using pale colors next to each other. This adaptation can be done in patient's home specially children born with very poor vision or with elderly to give them their independent living and mobility.

Field Expanding Devices

This has been very challenging situation for all practitioners. Patients who lose their peripheral vision due to eye pathology like in glaucoma, Retinitis pigmentosa will always have

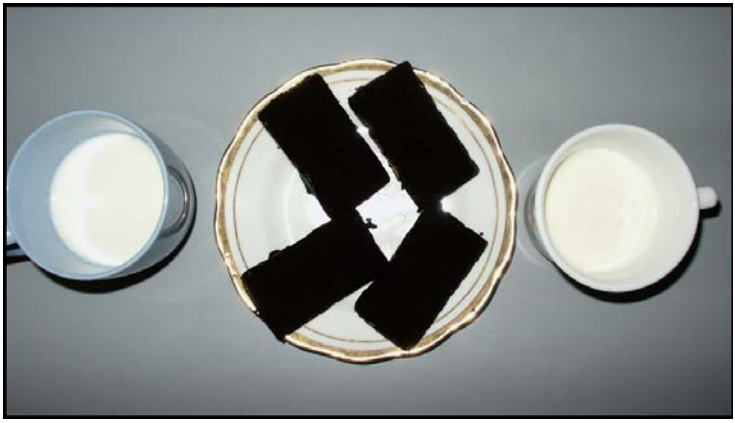


Fig. 7.9: Enhance of contrast

difficulty in mobility and locating objects in the room. Certain optical devices have been designed to overcome this problem by incorporating prisms or mirrors. Prisms are placed to increase peripheral awareness, or to shift the entire usable field to more straight ahead position. It has also been used in hemianopic field loss.

A reverse telescope is an easy example of field expander but are rarely tolerated or accepted due to minification. It is just like seeing through a doorbell. Magnifying systems have been incorporated, but visual acuity ultimately reduces in relation to minification.

The best option still is to learn to adapt to the peripheral field loss by scanning technique and become more proficient gradually.

Pinhole Glasses

Pinhole glasses are based on the principle of the pin hole. Multiple holes are made in the glasses of holes approximately 1 mm in size. The distance between the multiple holes should be at least 3 to 3.5 mm or approximately the size of the pupil. These glasses can be used in patients with corneal opacities or conditions which lead to irregular reflex. Though contact lenses are always a better option to improve vision yet these glasses have their place whenever contact lenses cannot be prescribed. These glasses should not be prescribed in patients with central field defects or losses as this will reduce the illumination and visual acuity.

Contact Lenses

Rigid Contact lenses are used to improve vision in all cases of corneal irregularities. Soft, iris painted designs can be also prescribed to patients with aniridia or albinism. Contact lenses can also be used to make a telescope by prescribing a high minus contact lens and a high plus power objective spectacle lens.

Visors, Wide Beam Hats, Clip on Shields and Umbrellas (Fig. 7.10)

These can be advised to all patients who are bothered by glare and suffer reduction of vision in bright sunlight. These are indeed very effective.

Fig. 7.10: Caps, umbrellas and sunglasses

Fig. 7.11: Folding cane for mobility

Mobility Assisting Devices (Fig. 7.11)

Patients with poor visual acuity, night blindness or ones with peripheral field loss, (especially less than 20 degrees) suffer a major problem of mobility. Besides giving them best possible spectacle correction they can be advised the following of these:

a. Long canes
b. Dog guides
c. Strong portable torch lights
d. Night scopes?

Other Assistive Devices

8

Assistive Technologies

In every facet of our lives, technology is advancing at a very rapid pace. This is equally true in the area of vision rehabilitation. What follows is a brief overview of available assistive technologies.

Optical low vision devices have an advantage of being more affordable and portable. They utilize the principle of optical magnification to help the visually impaired. These assistive technology devices are expensive but overcome the limitation of optical lenses like reduction in field of view, working distance and contrast. They are also more effective when used.

Assistive technologies are tools that help people who are partially sighted or blind be more independent at work, in school and at home. These tools, which can be sophisticated or surprisingly simple, are designed to make it easier to access printed material, to use computers, to travel and to perform activities of daily living.

Assistive technology incorporates high tech methods. Some examples of assistive **technology includes:**

- **Video magnification systems** like closed circuit televisions (CCTVs) and portable video magnification devices
- **Computer hardware and software** that provides screen magnification, synthesized speech, tactile display, or combinations of these
- Other assistive **devices for daily living**, like talking scales, talking glucometers, color identifiers, talking compasses, and a variety of other devices.

COMPUTER BASED SYSTEMS (Figs 8.1 to 8.3)

Computer based systems, which allow users to access information using screen magnification, speech output, or both, are also popular. Computers can be used in conjunction with scanners to allow users to import typewritten material, which

Fig. 8.1: Computer screen magnifier

Fig. 8.2: Magnifying or talking software

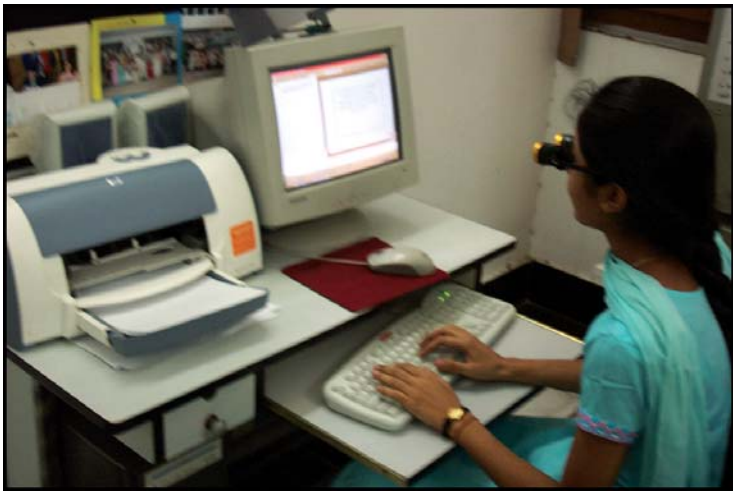


Fig. 8.3: Telescopes for intermediate tasks

they can then access, using speech or screen enlargement. For those people who are not computer users, standalone systems can convert typewritten text to speech and read documents aloud in a synthesized voice

These hi-tech devices are gradually adding in the market, helping more and more visually impaired and getting more affordable, and will form the ultimate devices for the visually impaired patients in future.

Computer Education Software (Fig. 8.4)

JAWS screen reading software for the blind

It is software which converts a normal PC into a talking computer so that the blind can learn to operate the computer independently.

Connect out load internet and e-mail software

Connect Out loud is designed for the beginner to the experienced computer user to access the Internet through speech and Braille output.

Fig. 8.4: Computer accessories–bigshot screen magnifier, huge letter large keys, keyboard, zoomtext magnifier/screenreader

MAGic 8.0 is screen magnification software with speech. The software magnifies the information the person chooses, from two times to 16 times its normal size MAGic reads the information aloud as users type it-either character-by-character or word-by-word, or they can move the mouse over existing text and hear it. The speech option is particularly helpful when listening to entire paragraphs, email or lengthy documents on the Internet. Speech can be used in conjunction with the magnification or independently.

ELECTRO-OPTICAL DEVICES

The primary electroptical device is a standard CCTV (Closed Circuit Television) System.

The CCTV system consists of a Monitor, a camera, a table or platform where the reading text can be placed. It also has controls for the brightness, contrast, color contrasts, change of polarity from white to black letters on white background and for magnification.

CCTV's, also called video magnifiers, use a small camera to display and enlarge text or images on a TV or computer styled screen. Magnifications powers vary from one model to another, with most magnifying from 3 X to 60 X. CCTV's come in both black and white, and color models. While most CCTV's are desktop units, portable units are also available. CCTV's can be used to read any text - such as novels, newspapers, and letters. As well they can be used for viewing pictures, writing letters, doing your nails, etc.

Electronic visual aids offer many important and unusual features. The degree of magnification can be varied from 4 x to 60 x depending upon the size of the screen and the brand. The patient can sit at comfortable reading distance and vary magnification and contrast according to visual status.

An advanced model is a portable one or a head mounted virtual reality display unit.

These devices are a major advantage of magnification.

On demonstration to our patients the acceptance of the product is very high. But the motivation depends on the patients need to read as the cost is the major limiting factor in dispensing this device. Children who are visually impaired and whose parents well aware and motivated are the most successful ones using these devices. An impaired office worker will also benefit by this.

In every facet of our lives, technology is advancing at a very rapid pace. This is equally true in the area of vision rehabilitation. What follows is a brief overview of available assistive technologies.

Current video magnification systems include:

- Desktop CCTVs with enhanced features (auto focus, speech commands, flat screens, text manipulation) (Figs 8.5 to 8.9)

Fig. 8.5: CCTV system

Fig. 8.6: TVi classic with fixed magnification

Fig. 8.7: TVi prisma

Fig. 8.8: CCTV systems from Telesensory

Fig. 8.9: Speech output automatic text reader

- Handheld cameras that interface with a standard TV set or other portable devices, such as head borne video displays or miniature flat panel displays
- Head mounted systems where the camera and LCD displays are combined in a single unit
- Self contained portable units, where the camera and screen are in single unit (these now include miniature LCD magnifiers that are very small and lightweight).

INDEPENDENT LIVING DEVICES (Figs 8.10 to 8.17)

Devices for daily living, like talking scales, talking glucometers, color identifiers, talking compasses, and a variety of other devices.

SOME INDEPENDENT LIVING AIDS FOR VISUALLY IMPAIRED

Fig. 8.10: A talking mobile phone

Fig. 8.11: Parrot voice mate talking diary—A talking diary

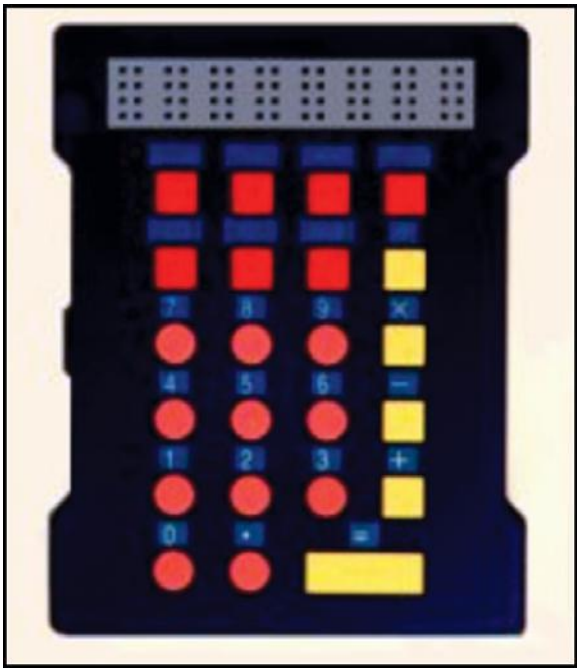


Fig. 8.12: The Leo Calculator—calculator's scientific functions

Fig. 8.13: Talking alarm clock, watches

Fig. 8.14: Recreational items like:
Large print playing cards, Braille dice

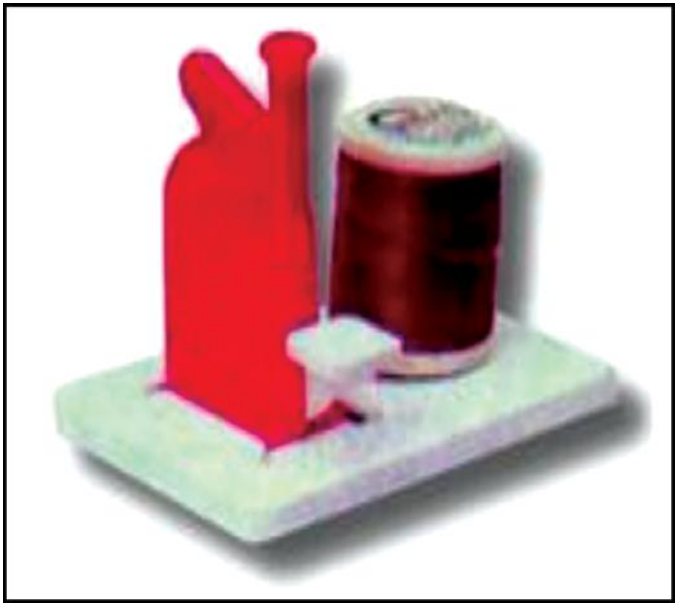


Fig. 8.15: Needle threader

Fig. 8.16: Cooking devices like measuring cups, liquid alarm filler

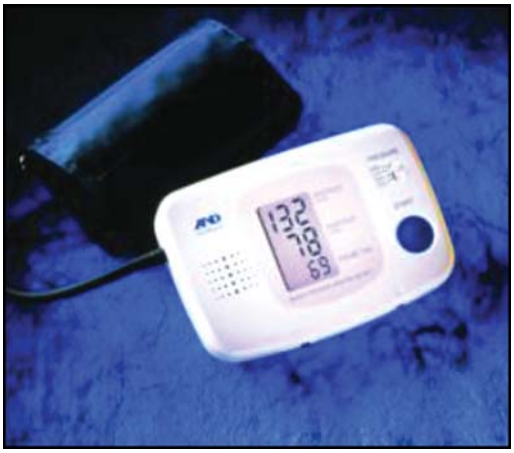


Fig. 8.17: Health items like talking blood pressure meter, talking glucometers, talking thermometer

An ever-increasing number of "simple" technologic devices that provide greater accessibility for those with vision impairments have been appearing on the market, such use speech recognition to cell phones with talking alerts.

Who will Benefit?

When optical devices are difficult to use, assistive technology may allow the person to function more effectively.

Technology continues to improve, and in many cases, has also become less expensive. Ultimately, all of our patients will benefit from assistive technology in the future.

Selecting the Devices for Partially-Sighted

9

Before deciding for the device a brief history and detailed needs of the patient has to be evaluated. Basically, all devices are made to enhance the residual vision, but which device will depend on many factors.

Following are the considerations to be dealt with before prescribing the device (Figs 9.1 to 9.6).

1. Age of Onset of the Disease

Patients with congenital abnormalities or those born with visual disability are always the cooperative ones. They are willing to use almost all types of devices and value them. Patients with acquired visual disability are the difficult ones they need to be motivated and explained a lot before prescribing the device.

2. Eye Pathology

There signs and symptoms depend upon the eye pathology. Based on these the devices are selected and advised. This further depends upon the field defects, contrast and glare associated with the disorder. The progression of the disease is also a deciding factor in the type of device to be prescribed and will also consider the rehabilitation intervention for the patient.

3. Type of Field Defect

In addition to the type of disorder the effect of the individual's eye pathology on the visual field will also affect the performance of the device. The field defects should be classified according to four categories (Faye's classification): no field defect, central

Fig. 9.1: Options-binocular telescope

Fig. 9.2: Options-handheld telescope

Fig. 9.3: Options-reading telescope

Fig. 9.4: Options-hand magnifier

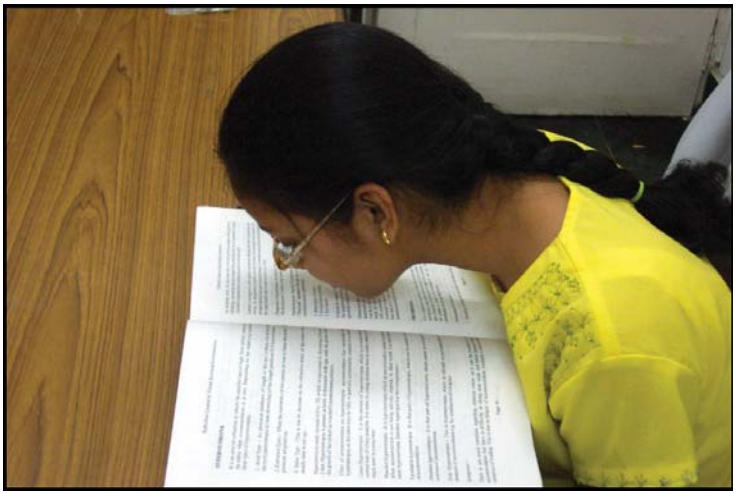


Fig. 9.5: Options-magnifying glasses

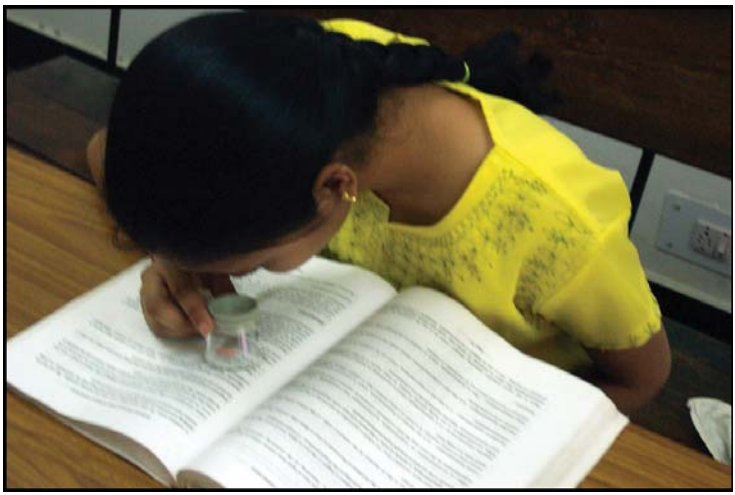


Fig. 9.6: Options-stand magnifier

field defect, peripheral field defect or combination of the above. Large central field defects or tubular fields will limit the use and benefit of the device. This has been further explained in detail in the following chapters.

4. Educational and Occupational Demands

It is very important to know the interests of the individual by understanding his occupation and social interests. Very often one may, come across the patient referred for low vision service with no educational background. Such individual has very little concern for the near, specially the reading or writing task. Prescribing them the high plus low vision glasses will take lot of effort in motivating them, or perhaps find very little usage in their daily routine. They may need more of rehabilitation and counseling than the optical devices. Some, literate one's may be very particular with reading devices. Others may be working on computers so will benefit by special software's for the impaired.

5. Motivation and Psychological Factors

It is understandable that visually impaired individuals will be the worried ones. Some may not accept the devices for the fear of being called abnormal or blind. There is great variation in the response of each individual over the acceptance of the device. It is never generalized. Some will be unhappy ones even after your good results, and some will be grateful enough.

6. Cost of the Device

It does matter to some. Expensive electronic devices are good but economically unacceptable. The patient should be demonstrated the devices useful to him, and a brief idea of the cost also delivered to him. Many visually impaired patients are actually out of their job and have poor means to afford. The final decision has to be also based on this.

7. Optical Considerations of Selecting the Device

The working distance, working space, field of view, lighting etc will depend on patient's pathology and needs. So the judgment has to be made after understanding these variables. Details of these variables with respect to each device have already been discussed.

Types of Visual Field Defects—Their Effects and Intervention

10

The differences in how people use vision are not always related to measures of distance visual acuity or near vision it is because of the type of field defect they have.

Quite often patients with low vision will be seen to have some or the other field defect depending on the pathology. It is an important investigation to identify the type of the defect so that one can understand their functional implications and behavioral manifestations. Based on this, the practitioner can plan strategies and the possible low vision devices that may help the patient in overcoming the disabilities.

Vision loss can be classified into 4 basic categories:

1. Peripheral field loss
2. Central field loss
3. Overall blurred vision
4. Hemianopic defects.

OVERALL BLURRED VISION (Figs 10.1 and 10.2)

It means that the person has diminished visual acuity and is unable to perceive details.

Such patients will show following signs:

- Reduced visual acuity
- Reduced contrast
- Poor night vision
- Glare and photophobia.

These signs will manifest following complaints from these patients;

- Difficulty in recognizing far of objects and details
- If the vision is poor enough they will bump into objects and furniture with poor contrast

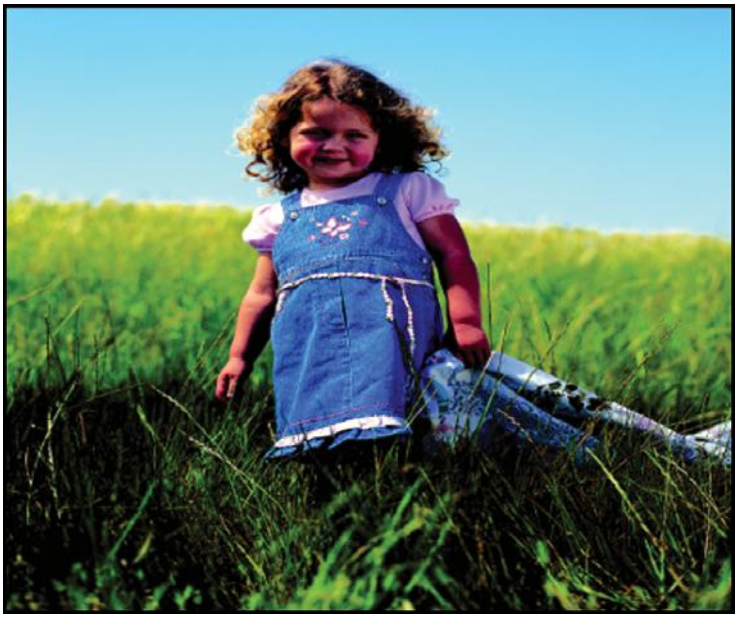


Fig. 10.1: Normal vision

Fig. 10.2: Overall blurred vision

- Difficulty in reading and writing
- Unable to write in straight lines
- Glare
- Loss of confidence in going outdoors at night.

The following *intervention* is helpful in solving their complaints

- Increase contrast—in the house by using high contrast color schemes in furniture, door, windows etc.
- Enhance contrast in reading and writing—use bright light, fairly good contrast print and black bold tip pens to write
- Advise to carry a flash light, and install strong intensity light sources (preferably bulbs to fluorescent tubes) in staircase, kitchen, rooms, or work areas
- Absorptive lenses and filters will help outdoors to reduce glare
- These patients accept high plus add near glasses and magnifiers as LV devices.

CENTRAL VISION LOSS (Fig. 10.3)

This group refers to patients who have total or partial loss of central field of vision.

These field defects are likely in following diseases: Chorioretinitis, diabetic maculopathy, hypertensive retinopathy, macular degeneration, degenerative myopia, optic atrophy (congenital), retrobulbar neuritis etc.

Such patients will show following *signs:*

- Partial perception of people and objects
- Cannot discriminate fine details for distance and near
- Poor color vision
- Further reduction of visual acuity in bright light.

On taking their history the flowing *complaints* are often referred to:

- Inability to see faces and recognize people
- Squint or abnormal eye posture to visualize objects
- Difficulty in reading and near tasks
- Cannot discriminate colors of clothes
- Withdrawn personality and prefers to stay indoors. Lacks confidence in going outdoors.

Fig. 10.3: Central field defect

Following are the possible *intervention* or devices which can help the patients who lose their central vision.

- Inability to recognize people can best be tackled by the cooperation of the friends and relatives. They should be told to introduce themselves whenever they enter the room. This will save the patient from social embarrassment
- Advise sitting close to the object like during watching TV
- Reading disability is a major problem to solve. Denser the central vision loss greater is the problem in correcting them by optical devices. Reading can be possible by bringing the object as close as possible. High plus add glasses with full field frame may help. Stand Magnifiers usually work in helping them read through the eccentric areas
- Enhance Contrast of the room and furniture
- Avoid tasks which require fine visual acuity for near.

PERIPHERAL VISION LOSS (Fig. 10.4)

This group refers to the patients who have lost their peripheral field of vision, totally or partially.

Fig. 10.4: Peripheral field loss

These defects are likely in the following pathologies: Chorioretinitis, Colobomas, Glaucoma, Degenerative myopia, Optic atrophy (neurological) Retinitis pigmentosa, Retrobulbar neuritis, etc. (Figs 10.5 and 10.6).

The patients with peripheral loss of field will show following *signs:*

- Mobility problems both indoors and outdoors
- Slow dark adaptation
- Poor vision in dim light
- Poor near reading vision depending upon the extent of the field defect
- Glare and photophobia.

These patients will have following *complaints:*

- Knocking over objects, and uncertainty in moving around
- Inability to find or locate objects
- Difficulty in reading because the words get lost.

Fig. 10.5: Field defect—glaucoma

Fig. 10.6: Hemianopia

The *Strategies* or advice which may help such patients are:

- Teach systemic scanning
- Keep minimum required furniture in the room with the objects in well defined areas
- Field expanders may be help?
- Give time to eyes from moving indoors to outdoors and vice versa to allow for slow dark adaptation
- Use sunglasses or glare cutting devices outdoors
- Reading vision can be improved by, high plus lenses or magnifiers. Care should be taken that magnification factor should be limited such that it does not get go too large as to fall into scotoma region. These patients will then have very small number of alphabets read one at a time. This will ultimately lead to scanning problems and difficulty in joining alphabets to form words
- CCTV systems or electronic devices help more in such cases than those with other type of field defects
- Patients should avoid traveling alone in dim light and as far as possible carry a flash light with them.

Visual Aids and How to Use Them?

11

MAGNIFYING READING GLASSES

They will suit most of the low vision individuals, although the user must expect limitations.

Firstly, the patient should understand that the irregular distorted image will remain distorted but will become more readable. The field of reading will become narrower, stronger the magnification, narrower the field. Therefore, adjusting the distance of the reading material from the eye to find the clearest image is very important.

To use it, thus, the patient has to hold the reading material held up to the nose and then moved slowly backwards until it becomes clear (Fig. 11.1).

Fig. 11.1: Reading glasses

A slant reading table with proper illumination is important to avoid improper head and neck posture.

MAGNIFIERS

Hand Magnifier

To use a hand magnifier, you should hold the magnifier up to the reading material and move to away from the print toward your face until the image totally fills the lens. At this point the magnifier should be moved 3/8th of an inch towards the print, and it will be in focus and enlarged (Fig. 11.2).

Stand Magnifier

The stand should be resting flat against the page or object that is to be read. If the stand is moved off the object, the image will usually blur. These are fixed focus magnifiers (Figs 11.3 and 11.4).

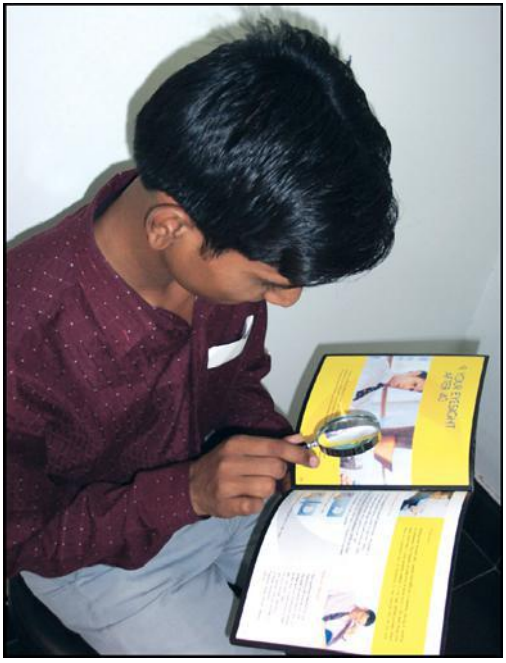


Fig. 11.2: Hand magnifier

Fig. 11.3: Stand magnifier read as close to lens

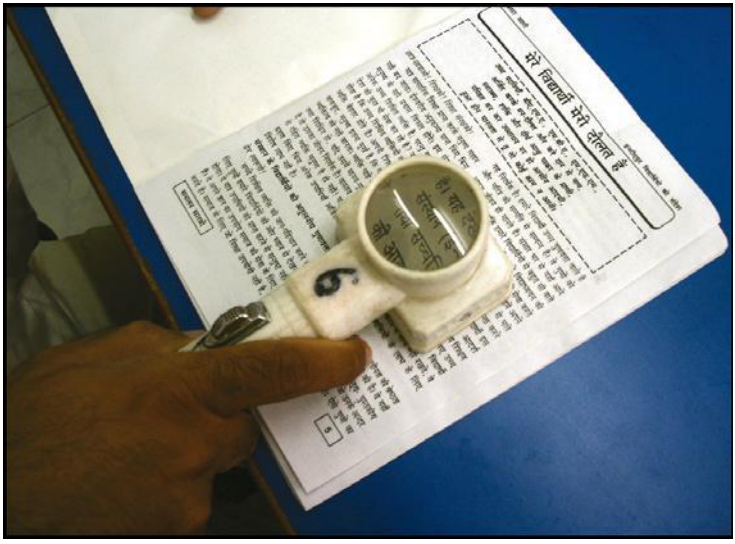


Fig. 11.4: Self-illuminated stand magnifier

SOME TIPS FOR YOUR PATIENTS

1. Brightest possible light is not necessarily the best.
2. Visual effort will produce no ocular damage, though visual and emotional fatigue may set in more rapidly.
3. The more you use your vision the better the brain will interpret what is seen.
4. Practice is essential in re-educating.
5. It is important to read each day. Start slowly initially, may be from 10 minutes to more gradually. The more it is practiced the easier it will become with time.
6. It is important to stress, again, that the use of magnifiers or holding objects close to the eyes will not harm the eyes.

PATIENT INSTRUCTION STEPS: HOW TO USE THEM

The patient can be guided or best possible given a printed instruction guide to reinforce the instructions you have given during the training. The instruction sheet as far as possible it should be printed in font size of at least N/18.

Sample of Instructions for Optical Devices

How to Use Your Reading Spectacles (Fig. 11.5)

- These are special low vision reading glasses to assist you in reading and near work. Use your right/left/both eyes
- Place the reading text at a distance of ———————— cm ALWAYS while reading
- Start using these glasses for small intervals initially like 10 minutes and increase time gradually. They might cause strain initially. Start with bold print initially. You will certainly adapt to them
- You can read continuously to a maximum of 20 to 30 minutes. Give break for 5 minutes then continue further if needed
- Use a reading lamp if recommended or sit in natural daylight to read better

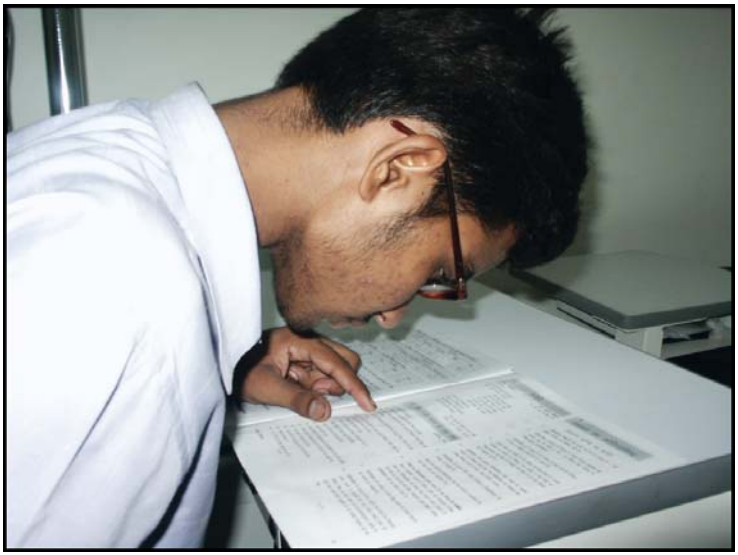


Fig. 11.5: Using magnifying glasses—10 D—working distance = 10 cm

- Do not use them for distance vision like watching TV or walking.

How to Use Your Hand Magnifier

- The hand magnifier will assist you in reading and near vision. Use your right/left eye to read with this
- You have to use this along with your distance/reading glasses
- Hold the magnifier close to the book , then lift it up gradually towards you till you see the text bold and clear. Hold the lens at this distance always to read
- Practice daily for short time then increase gradually
- Read in bright light if recommended.

How to Use Your Stand Magnifier (Fig. 11.6)

- Your stand magnifier will assist you in reading. Use you right/left eye while using it

Fig. 11.6: Stand magnifier, slant reading table and lamp

- Keep the magnifier flat on the book and slide/move it along the page
- Bend as close to the magnifier to read the maximum number of letters at a time
- Use a reading table which will raise the reading text to give you a comfortable posture
- Use a reading lamp if advised. Your magnifier may be a self illuminated one and have an inbuilt lamp
- Practice daily for short period of time and then gradually increase.

How to Use Your Distance Telescope (Fig. 11.7)

- Your binocular/monocular Telescope will help you to see objects at a certain distance. This will help you in seeing the blackboard, bus numbers, street signs, TV etc Use it for your right/left/both the eyes
- The telescopes have an adjustable focus and adjust to focus at the object you wish you wish to see
- First spot the object you wish to see. Then hold the telescope from one side to your eye and focus

Fig. 11.7: Handheld telescope

- Do not use while walking
- You may see a small area at a time. Learn to track along.

INSTRUCTIONS TO USE SOME NONOPTICAL DEVICES

Reading Lamp (Fig. 11.8)

- Reading lamp will improve the contrast of the print
- Adjust the lamp directing towards the reading material and not towards the eye
- Clean the lamp bulb every week or change them whenever dull
- Use a _____ watt incandescent bulb or _____ watt fluorescent tube as advised.

Slant Reading Table (Fig. 11.9)

- The slant reading table will give you comfortable body posture while reading with/without your low vision device

Fig. 11.8: Reading lamp

Fig. 11.9: Slant table, lamp, writing guide and bold tip black pen

- Adjust the angle and the height of the board in such a way that the middle portion of the table is at the level of your eyes
- Hold the page flat with the clips.

Writing Guide

- This will help you in writing in straight lines on a A4 sheet
- Open the guide and keep the writing paper inside make sure the corners fall within the corners of the guide
- Now feel and find the empty cut out spaces and start writing
- Use a black bold tip pen to write.

Signature Guide (Fig. 11.10)

- This rectangular black card will help guide you in signing
- Place the guide firmly where you need to sign
- Feel and find the empty cut out space and sign in the cut out portion
- You might need a friends help to locate the place to sign.

Notex (Figs 11.11 to 11.13)

- This rectangular piece of Rexene/board with cuts/steps on top corners will help you in identifying the value of the currency notes

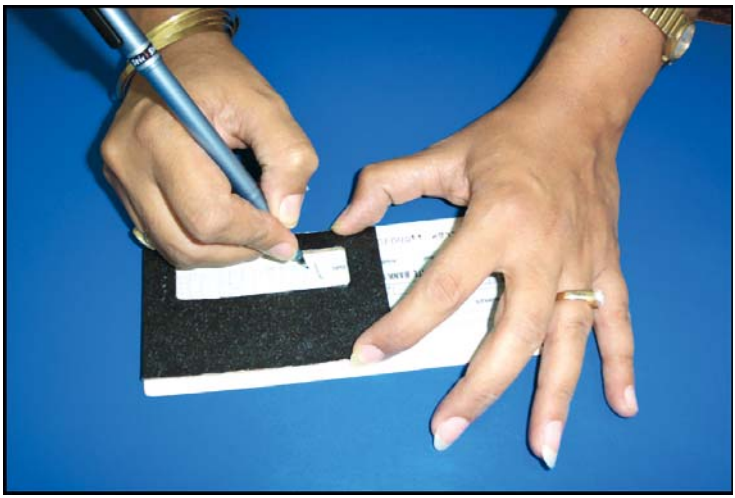


Fig. 11.10: Signature guide and bold tip black pen

Fig. 11.11: Notex

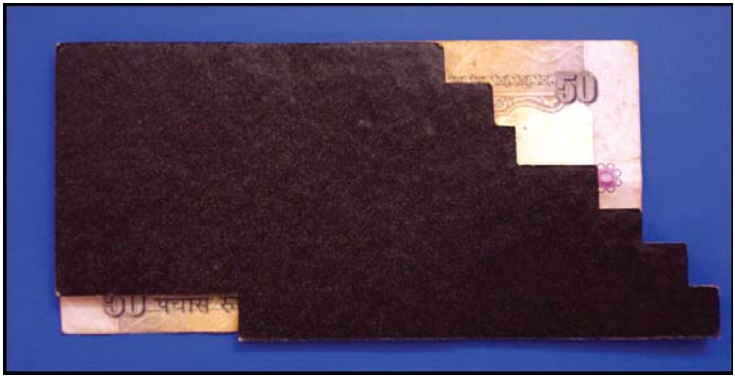


Fig. 11.12: Notex 2

Fig. 11.13: Notex 3

- Each note Re 1, Rs 2, Rs 5, Rs 10, Rs 50, Rs 100 and Rs 500 all have their size marked along the serrated edge of the notex
- Place the particular currency note behind the notex
- Align the currency note properly with the edges and feel the size with the finger
- Commit to memory the corresponding note and the respective cut
- 1st Cut Indicates Rs 500/-
  2nd Cut Indicates Rs 100/-
  3rd Cut Indicates Rs 50/-
  4th Cut Indicates Rs 10/-
  5th Cut Indicates Rs 5/-
  6th Cut Indicates Rs 2/-
  7th Cut Indicates Rs 1/-
- To find out the difference between a twenty rupee note and a fifty rupee note, touch the side cut at the bottom left hand corner of the notex.

(The twenty rupee note is narrower and will not cross the cut at the bottom of the notex. A fifty rupee note will cross beyond the cut as it is broader and covers the full length of the notex.)

Eye Disorders and Low Vision

12

There are certain disorders which are frequently seen the low vision clinic. Based on the disorder the possible complaints and the intervention can be estimated. A few of the disorders are listed below.

RETINITIS PIGMENTOSA

Retinitis pigmentosa is commonly seen in low vision clinics. The patients have lot of expectations and frustrations. Patients with tubular fields have mobility problems and find it difficult to adapt to their condition. The fear of growing blind and passing the gene is great. With best possible devices it becomes difficult to convince them. They are the ones who need help of a psychologist to help them cope up with their disability.

In early stages intervention is possible by advising them filters to reduce glare. Both hand and stand magnifiers are useful. They should be self-illuminating ones. Guidance regarding increase in illumination is important for them. We also have field expanding telescope for distance, which usually do not show satisfactory results.

Helpful Hints for Persons Suffering from RP

It is very common to see a RP patient in a low vision clinic. Most of these RP patients have mobility problems due to tubular fields. They may be able to read enough lines on the near and distance vision charts. Their disability can be dealt by Environmental modifications that can help the person suffering from retinitis pigmentosa perform functional tasks.

Lighting

- Use plenty of floor lamps and table lamps in recreation and reading areas, remember that light should always be aimed at the work and not at the eyes
- Use blinds; sheer curtains, or drapes for windows as this would help in adjustment to natural light
- Avoid waxing floors, use nonskid, and nonglare products to clean and polish floors
- Use handy flash lights at nights for safe mobility
- Use peaked cap or the recommended tint glasses for glare comfort.

Furniture

- Use brightly-colored accessories, such as vases and lamps, to make furniture easier to locate
- Keep desk chairs and table chairs pushed in
- Move large pieces of furniture out of the main traffic areas
- Remove electrical cords from pathways, or tape down for safety
- Make the stairway railings extend beyond the top and bottom steps.

Use of Color Contrast

- Place light objects to dark background, e.g. dark tables near a white wall
- Install doorknobs that contrast in color with doors
- Paint the woodwork of the doorframe a contrasting color to make it easier to locate the door
- Mark the edges of all steps and ramps with paint or tape of a highly contrasting color.

We can only give hope to these patients that the World wide research is aimed at finding a cure for RP and is making good progress.

Macular Degeneration (Figs 12.1 to 12.3)

The second most common disorder is Macular Degeneration (MD). In the early stages of MD, central vision is blurred and seeing at a distance or close work is difficult. The eye may still have good side vision, but black spots appear in the center. This makes reading or seeing faces difficult.

Other symptoms include: poor color vision, difficulty in judging heights and distances, and some difficulty with tasks which require focus for near such as pouring tea. Sometimes only one eye loses vision, while the other eye may see well for years.

MD does not lead to total blindness. People with MD mostly retain good side vision. This means they can cope well with most daily tasks.

The magnification devices can be very useful. High plus near magnifying glasses, stand magnifier, CCTV System and daily living aids such as needle threader, large print books, and proper lighting or a combination of these can help the person with MD to be independent and lead a normal life. Laser treatment can be useful if the condition is detected early.

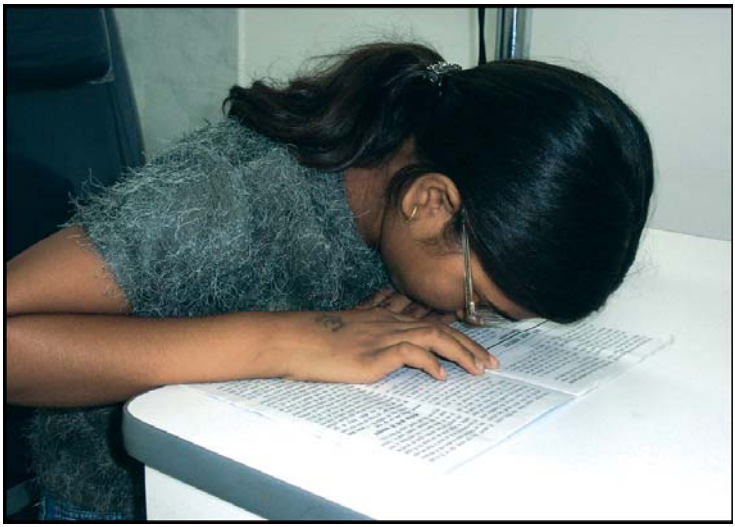


Fig. 12.1: Macular degeneration — able to read with magnifying glasses

Fig. 12.2: Macular degeneration using telescope in classroom

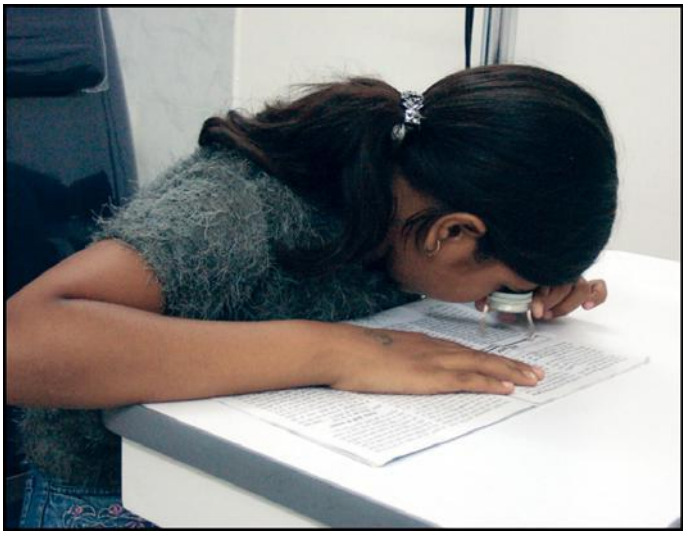


Fig. 12.3: Macular degeneration — prefers stand magnifier

Patients with dense, wide area of central field loss in advanced stages may benefit from stand magnifiers compared to the high plus reading glasses. In stand magnifiers they can use their peripheral vision to the best to read.

GLAUCOMA

Glaucoma is a leading cause of blindness. If it is diagnosed early, blindness is nearly always preventable. If uncontrolled it leads to several field defects.

As low vision aid specialist patient should be advised to be under regular follow-ups. The contrast acuity also reduces in such cases, so increased illumination and magnifiers are a great help to them. Filters should be advised to prevent glare. High plus reading glasses are also useful provided the field loss is not extensive. Prognosis of improving with optical devices is bad if the field loss is extensive.

Age Related Macular Degeneration ARMD (Fig. 12.4)

Too often a patient with ARMD is seen in our clinic who is not treatable by laser of undergone laser treatment is advised by

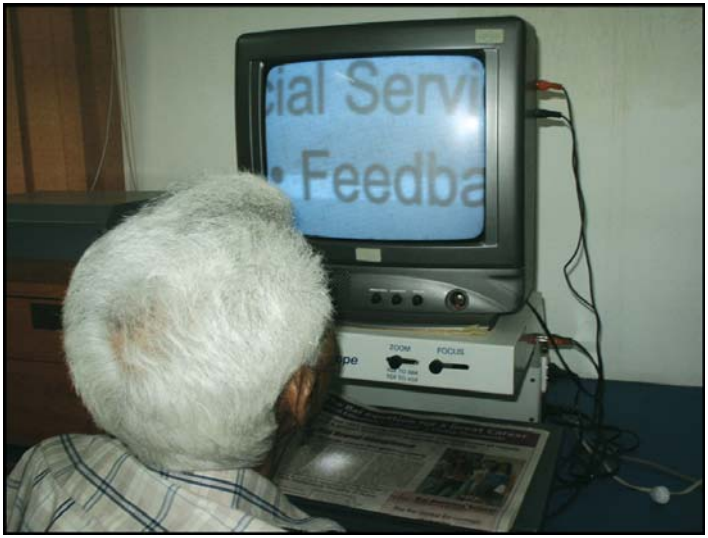


Fig. 12.4: ARMD—patient using CCTV system

the ophthalmologist that nothing else can be done. The ARMD patient will have total or partial loss of central field of vision. Such leads to behavioral manifestations like inability to recognize people in front of them, difficulty in reading because the words miss or are distorted. Since they are usually the middle aged or the elder ones who have acquired this condition which hampers their profession and may depress them to lead a retired life.

While the peripheral retina may not reproduce perfect images, yet it is functionally useful. The amount of image enlarged necessarily depends on the extent of the central damage or scar. Patients with large central scotoma can also be tried, to train them to utilize their peripheral vision. Over 90 percent of patients with ARMD succeed in using some kind of magnification and aids. Stand magnifier and the magnifying glasses should be full frame or large aperture ones. Many patients prefer the worse eye to be occluded rather than binocular conditions. The success depends on the understanding the need and motivation of the patient. If the patient complains of inability to recognize people in front of them. Advise the patient's relatives to introduce themselves whenever they enter the room. The patient may complain of inability to make eye contact or read lips, advice patient to stand closer and adjust illumination. If the words are distorted or missing while reading the patient should bring the reading material closer, adjust illumination and use appropriate device.

CATARACT (Figs 12.5 to 12.7)

Cataract is also an important cause of low vision in both developed and developing countries. Even where surgical services are available, low vision associated with cataract may still be prevalent, as a result of the long period spent waiting for operations and barriers to surgical uptake, such as cost, lack of information, and transportation problems.

The person with a cataract may have blurred vision, suffer from glare and find bright lights uncomfortable. Colors may not appear to be as bright and objects look dull.

Fig. 12.5: Cataract—uses reading glasses and magnifier

Fig. 12.6: Aphakia—uses separate high plus reading glasses

Fig. 12.7: Aphakic bifocals—add magnifier for fine reading

The progression of cataracts varies between each individual and often between each eye in the same person. In some cases, the person affected can see well in the house but find vision is reduced by glare or at night.

Till the surgery is done (sometimes avoided willingly) these patients are referred to low vision clinics. Prescribe them best corrected glasses with dark tints for outdoors to prevent glare and discomfort. For near Hand magnifiers along with near correction or high plus adds work the best. In some cases a change of glasses may be of benefit. In others, cataract surgery may be the best form of treatment. Special lighting and magnifiers are also useful.

HOMONYMOUS HEMIANOPIA AND OPTIC ATROPHY (Fig. 12.8)

This is a condition sometimes found after a stroke or some injury to the brain. Hemianopia may be complete or partial. In the case of complete, the person affected can only see to one side

Fig. 12.8: Secondary optic atrophy with telecope for watching distance signs

when looking straight ahead. With partial Hemianopia, objects appear different in clarity or brightness. Other effects include double vision and difficulty interpreting visual information (especially if the view is complex or involves many moving people). Sometimes, the visual image may completely disappear or distort.

Hemianopia can cause loss of confidence with doing simple daily tasks. The person may feel unsafe crossing the road or going shopping, for example. Loss of half the visual field will affect many daily tasks including reading, travel and daily living skills.

Patients affected have to understand their condition and learn how to compensate for it. Hemianopia is not progressive but lack of understanding may cause frustration and needless dependence on others.

The possible intervention is to provide training exercises in effective visual scanning. These scanning techniques help to compensate for vision lost. This assists the person to gain

confidence and safety related to walking, personal care, household tasks, leisure and other aspects of daily living. Guide dogs can be useful for them to build their confidence

CORNEAL DAMAGE (Figs 12.9 to 12.11)

Corneal damage is a major cause of impaired vision in developing countries. The cornea can be damaged from infection, injury or other disease. The whole cornea can become cloudy or parts can be damaged by scars. The result is similar to cataracts; visual acuity is reduced, good contrast is needed and the amount of light affects vision. Glasses are unlikely to improve vision damaged by corneal scars or clouding. Contact lens can be advised if the condition of the eye permits it. Pin hole spectacles also work well in such patients. Magnifiers and magnifying glasses definitely improve vision.

Fig. 12.9: Uses hand magnifier

Fig. 12.10: Uses hand magnifier 2

Fig. 12.11: Corneal opacity with pinhole glasses

RETINAL PATHOLOGIES (Figs 12.12 to 12.15)

This forms a major group collectively in low vision clinics. The retinal surgeon greatly depends on low vision services. These group of patients are usually aware of there conditions and

Fig. 12.12: Diabetic retinopathy with near glasses and hand magnifier

Fig. 12.13: Diabetic retinopathy—high plus glasses

Fig. 12.14: ROP-needs bright light and has sufficient near vision required for her class level

Fig. 12.15: ROP - uses spectacle mounted spectacles for classroom

have several times been explained by the ophthalmologist that nothing can be done. Their motivation to utilize their residual vision is thus great, and accepts most of the devices.

There are a large number of conditions where the retinal problems can have onset in childhood but more commonly occurs in elder people. Both near and distance vision is affected when the central area of the retina is involved. Conditions like retinal detachment, Diabetic retinopathy, chorio retinitis etc are mostly seen. Most of the Low vision devices is often helpful if the vision loss is not severe.

ALBINISM AND ANIRIDIA (Figs 12.16 to 12.21)

People with albinism have pale or white skin and hair, and vision is poor. Near vision is usually better than distance vision. They can have nystagmus, refractive errors and subnormal visual acuity. Spectacles usually improve vision but do not give

Fig. 12.16: Aniridia—using cap and tinted glasses outdoors

Fig. 12.17: Aniridia using tinted glasses indoors

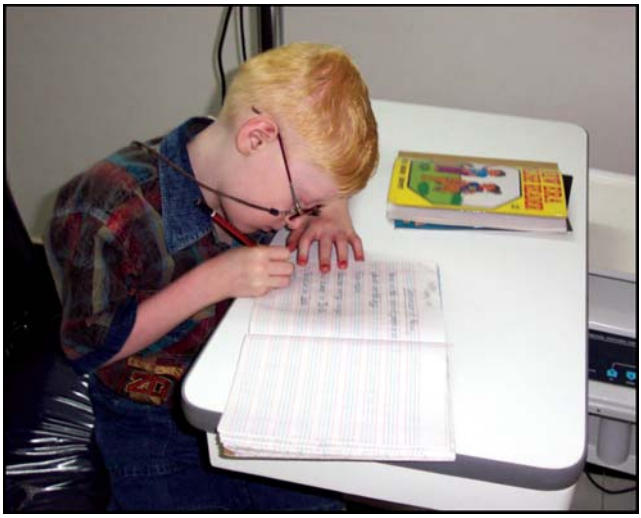


Fig. 12.18: Albinism—uses dark pencils and bold line notebooks

Fig. 12.19: Albinism—dark glasses outdoors

Fig. 12.20: Albinism—uses telescope for classroom

Fig. 12.21: Albinism—uses typoscope to reduce glare

normal vision. The early the intervention in childhood better is the vision. Albinos usually prefer dark or tinted spectacles. The skin should be protected from the sun. Low vision devices can be useful for distance and are sometimes needed for near activities.

MYOPIC DEGENERATION (Figs 12.22 and 12.23)

One will come across such patients very often in low vision clinic. They are concerned about their deteriorating vision, which may start hampering their distance vision. Students with vision between 6/60 to 6/18 are mostly able to read blackboards from front bench. Their near vision is usually good without glasses, at the focal point. It is not wrong to do so, and they should be asked to read the fine print without glasses. This is just like adding high plus to their distance correction. A slant table may be recommended to avoid neck strain. A magnifier is also useful for small print reading for short intervals.

Fig. 12.22: High myopia—remove glasses and slant reading table

Fig. 12.23: High myopia—magnifier with glasses for fine reading

Antireflection coating over the glasses is helpful in eliminating reflections from the glasses. They should be advised regular retinal check ups.

A Low Vision Child

13

If visual impairment is below 16 years of age is considered to be a low vision child.

The gravity and the magnitude of the problem of a low vision child for himself, his family and the community have been discussed.

The child found to have a low vision problem should have a low vision examination performed by an ophthalmologist or optometrist specially trained in low vision. This differs from a general eye examination in that much of the testing is designed to evaluate different aspects of visual function. Once the child's visual needs have been determined and his or her visual abilities have been quantified, appropriate interventions will be recommended by the doctor. These may range from prescribing glasses or special optical devices to referring for visual stimulation or mobility training. The goal of the low vision examination, for people of all ages, is to improve function through the use of devices and/or adaptive skills.

The most common disorders found in children with low vision are:

- ROP—Retinopathy of prematurity
- Albinism
- Heridomacular degeneration
- Congenital aphakia
- High myopia with degeneration
- Retinitis pigmentosa
- Optic atrophy
- Microophthalmos and colobomas
- Bilateral amblyopia.

Vision Impairment and Abnormal Development

When children have low vision it leads to delayed or abnormal development of the child. This also depends upon the age of the onset, the cause of visual disability and the degree of vision.

If Vision impairment is before 5 years of age, the child may have poor sensory motor skills. If the impairment is in mid childhood the child's other sense development may be delayed. In case of a teenager it may affect his independence as an adult. *Visually impaired child* → *Decreased movement in the world.*

THE EVALUATION

Technically all children need to be assessed like adults and need the same pre examination tests as in adults. *The only difference is in the way it has to be done*. Also the difficulties the child faces are dependent of parents' information. Most of the assessments are done by observation when the child is in the clinic for evaluation.

Working as a team with a pediatrician may help in examination of the child to discuss his overall development. One has to understand the parents concern and expectations. A careful history with the medical background has to be recorded.

History

Before working up a low vision child a careful history is important. It depends a lot upon the alertness and the cooperation of the parents. Parents are often found guilty of carrying the gene passed on to the child. They may come with fears of prognosis and some may not be able to accept the word that their child is visually impaired.

The following questions may be useful in taking their history:

1. Child's age and date of birth
2. Current academic status and level
3. Cause of disability

4. Type of disorder
5. Any other background information

Before assessing the vision status one has to understand the visual milestones and Development of vision with age.

Visual acuity testing in children greatly varies with their age and mental status. Among children with normal development visual milestone are:

	Age	*Visual milestone*
1.	29 weeks gestation	Pupillary reaction to light.
2.	Birth–1 week	Fixation present, follows horizontally moving objects
3.	4–8 weeks	Follows vertically moving objects.
4.	3 month	Watches movement of own hands, prefers faces, photographs and mirrors
5.	5 months	Blink response to visual threat (menace reflex).
6.	6 months	VEP acuity adult level stereopsis.
7.	9 months	Visual differentiation and pick up small objects.
8.	3 years	Vision 6/9-6/6 on tumbling E.
9.	5–7 years	Stereopsis well-developed.
10.	10 years	End of critical period of monocular deprivation

One of the foremost tests is *refraction*—to ensure best corrected visual acuity. All low vision examinations of the child depend on the basic procedure of retinoscopy a child's poor attention may be misdiagnosed as neurological problem rather than a high refractive error or loss of accommodation. For infants the basic correction should be for near. Thus in infants an addition of +2.0 D to +5.0 D may be added to his distance prescription.

The method of refracting the child may be an encounter or a nightmare for some. If we apply little skill and knowledge to refract the infants or children, this can be avoided.

To start with, we have to understand that it is the serious responsibility of the Practioner to correctly prescribe the refractive status, as the child will live with the benefits and side effect of the prescription all through out its life.

Why the pediatric group needs special mention in the series of refraction is because:

- We have to depend on the objective data, so it has to be as accurate as possible
- The refractive status especially in infants and toddlers is usually changes with age and growing eye
- This group is usually associated with binocular disorders so the prescription and management with glasses varies
- Cycloplegics are a must.

General Guidelines to Start Retinoscopy (Fig. 13.1)

- Have a warm and friendly smile being stern never works
- Toys and interesting articles are fascinating for kids. Old pens and empty cartons also attract them
- Avoid using words like it never hurts, because last time the child went to the doctor for vaccination he heard the same
- Reschedule appointment if the child is hungry or sleepy
- Sedation should be reserved for the most uncooperative ones or where complete examination is required.

Fig. 13.1: Retinoscopy of an infant

Cooperation of Infants and Toddlers

- It is easier to refract an infant than a toddler
- Perform the retinoscopy with the child on parents lap
- Fixation may be for short fleeting intervals towards the retinoscope light
- Sounds or name called out keep the child distracted
- Be very fast.

Co-operation of a Preschool Child

- It is easier to distract this group
- Though the fixation may be poor and they might be inattentive
- You need to find ways to attract this child.

Cycloplegics to be Used

Drug	*Percentage*	*Dosage*	*PMT done After – if possible*	*Use in*
Atropine ointment	1%	Tid for 3 days before refraction	2 weeks	Infants and toddlers, all with ESO deviation
Cyclo-pentolate drops	0.5% - less than 1 yr 1% - there-after	2 hours before every 15 minutes, 3-4 times	4 days	Preschool or children upto age of 7 years
Homatropine drops	2%	1 hour before, every 15 minutes, 3 times	7 days	Older children

Values obtained depend on the type of the cycloplegia used. For deriving the refractive error status. Subtract for the working distance from the retinoscopic value, minus 1 diopter for atropine and 0.5 Diopter for Cyclopentolate or HA drops. Neglect small cylindrical values.

Incomplete cycloplegia will result in

1. reduced reliability
2. high degree of astigmatism
3. prevalence of anisometropia

Auto-Refraction

AR's may give some helpful information only under cycloplegia. The best of AR does not screen without cycloplegia.

Aphakic Child

Prescribe as early as possible to prevent amblyopia. Overpluss by 2 diopters to prescribe the infants and toddlers for the near range. The usual prescription of infants and toddlers is around 20 diopters. Child above 2 years of age needs to given a bifocal.

In case of uniocular aphakic Contact lenses are best, but during the period when lens is not worn glasses with Plano lens in the phakic eye is prescribed followed by occlusion. Balance prescription is not given in the phakic eye else amblyopia may develop in that eye.

Type of Spectacle/lenses

The type of lenses prescribed is plastic lenses of CR or polycarbonate material with scratch resistant coating. Comfort cables or head band is advised to support the glasses. Plastic aspheric lenticular bifocals are also available for aphakic prescriptions, which are cosmetically and optically better.

Vision Evaluation in Infants and Children (Fig. 13.2)

Evaluation of vision is important in habilitation of the children. One has to assess the residual vision so as to improve their general development. Visual acuity alone does not quantify the disability. Other visual functions, like adults should also be done to assess child's functional state. The evaluation should be observed, informally, during the visit to the clinic. Child's general behavior, head posture, type of gaze and visual

Fig. 13.2: Vision evaluation in infants and children

communication should be recorded. The parents may be asked the questions to assess the degree of disability. Questions asked will depend on the age of the child.

Visual acuity assessment can be classified on the basis of age group:

Birth to 3 years	*Age of 3 to 6 years*	*Age > 6 years*
Fixation and following – Torch light.	Tumbling E	Snellen's test
Pupillary reflex	Landolt's C	
Occlusion test	Sheriden letter test	
Preferential looking chart	HOTV test	
Optokinetic nystagmus	Lea symbols chart	
Catford drum		
OKNOVIS		
Boeck candy test		
Ophthalmoscopic examination		
Electrophysiological test		

Distance Acuity

The low vision specialist should have besides the vision charts, a bright colour ball, picture book, small colored balls or buttons and toys in the clinic to assess the vision.

The ball may be rolled over and observe if the child can identify it and chase it. At what distance does the infant or the toddler respond to the toy.

TELLER'S ACUITY CARDS (Fig. 13.3)

This test is most useful and commonly used method for evaluating vision of infants and toddlers.

This is based on preferential looking test. It has seventeen cards of 25.5 × 51 cm out of which fifteen cards contain 12.5 × 12.5 cm patches. The square wave grating of alternating black and white stripes have a spatial frequency ranges from 38.0 cycles/cm to 0.32 cycles/cm. There is one low vision card containing 25.5 × 23.0 cm patch of 0.23 cycles cm. The seventeenth card is a blank gray card with no grating pattern. The snellen's equivalent can be recorded from the charts given along.

Testing distance for tellers depends upon the age of the patient:

- Infants upto 6 months –38 cm
- More than 6 months to 3 years –55 cm.

Fig. 13.3: Teller's acuity cards

Drawbacks

1. Measures near acuity and misses mild myopias upto 3 diopter.
2. Measures resolution acuity and not recognition acuity.

CARDIFF ACUITY CARDS (Fig. 13.4)

This is based on preferential looking test. It compromises of cards which have pictures of same size made with special double line with a white space in between. These pictures are visible at a particular distance and this is known as vanishing optotypes. They are more similar to recognition acuity. The visual acuity is described in Snellen's notations.

CATFORD DRUM TEST

This is based on the observation of pendular eye movement that is elicited when the child sees the oscillating drum with dots. The size of dots varies from 15 to 0.5 mm. The testing distances is 60 cm. Estimation of visual acuity is done on the basis of smallest dot that results in pendular eye movement.

Fig. 13.4: Cardiff acuity cards

The drawbacks of this test is that it overestimates visual acuity and not suitable for amblyopia patients.

ELETROPHYSIOLOGICAL TESTS-VISUAL EVOKED RESPONSE (VER/VEP)

This displays the electrical pattern of the cortex detected by surface detected by electrodes following light stimulation of the retina. The stimulation may be pattern or flash type.

INDIRECT ASSESSMENT OF VISUAL ACUITY IN INFANTS

Pupillary reaction: Present at 29 weeks of gestation. Reaction to bright light can occur even in premature babies.

Reflex responses: Starts at birth. It can be in response to sound, movement and touching the cornea.

Fixation: Present at birth. Show fixation preference to moving stimuli, blinking lights, pattern stimuli etc.

Follow movements: After going through visual milestones we know that horizontally moving are elicited first followed by vertical tracking.

OCCLUSION TEST

Resistance to occlude one eye indicates poor visual acuity in uncovered eye.

OPHTHALMOSCOPIC EXAMINATION

A detailed examination of fundus should be done routinely in neonates to rule out retinopathy of prematurity in premature.

VISION TESTS IN 3 TO 6 YEARS

1. *Tumbling E:* It consists of different sizes of E in four different directions: up, down, right, left. This is an excellent method for vision test but measures single letter acuity (Fig. 13.5).
2. *Landolts C:* This test is similar to Sjögren's arrow and hand chart.

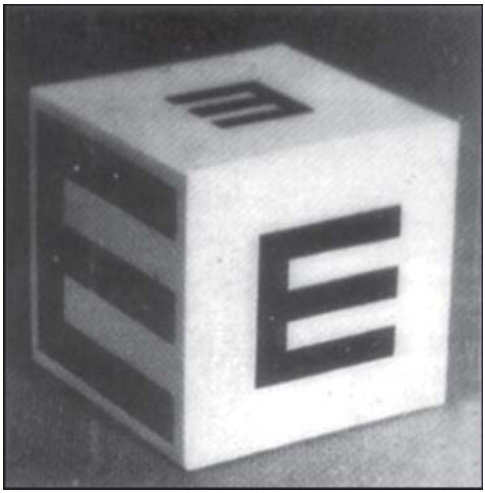


Fig. 13.5: Tumbling E

3. *Lippman's Hotv test:* Simpler version of sheridan letter test. Test distance is 3 metres.
4. *Lea symbols charts (Figs 13.6 and 13.7):* This is most acceptable vision testing method in children in this age group. The chart has pictures or symbols of like a square, circle, a cottage or hut and an apple or berry. This can be used with the most uncooperative ones, slow learners, deaf and dumb ones.

The assessment should begin by making the atmosphere most friendly and in a playful manner. A child who can describe these pictures should be first communicated properly as to the name of the symbol, then pointed out one by one and asked to identify.

Some children may not be able to name them properly or may be shy to answer. The next step is to ask them to match with the chart or the key card held in the hand. This also works well in children with additional disabilities like hearing and speech.

Some very shy ones may not reply at all. They should then be tried to say only yes or no by showing single – symbol flash cards.

Fig. 13.6: Lea symbols

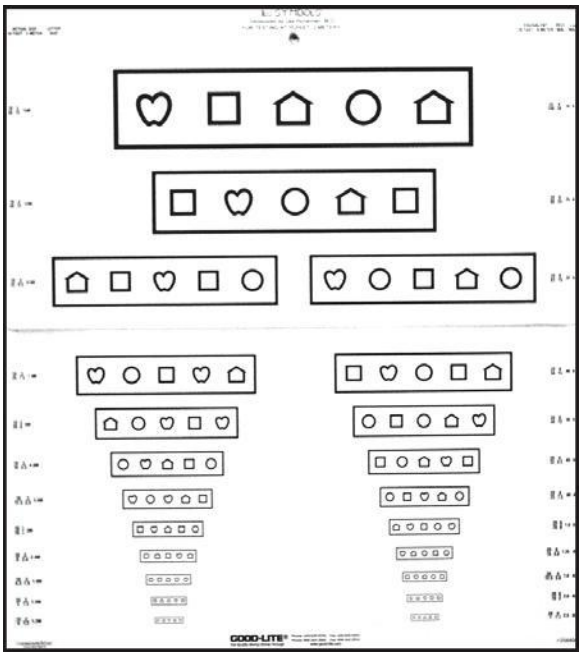


Fig. 13.7: Lea symbol chart

MORE THAN 6 YEARS

Snellen's charts: This is the most commonly used method of visual acuity assessment in adults.

Near Visual Acuity (Fig. 13.8)

For infants and toddlers the near acuity can be assessed by putting small toys, colored buttons on the table and observe if the child can locate them to hold.

Unlike adults this should be measured at any distance with any posture the child prefers.

Near acuity can again be measured by lea symbols test in 3 to 6 years of age group.

Reading Acuity

Measures, the reading ability of the older child. Continuous text charts should be used for evaluating this.

Angular Visual Acuity

Is done in amblyopia patients to avoid crowding phenomenon.

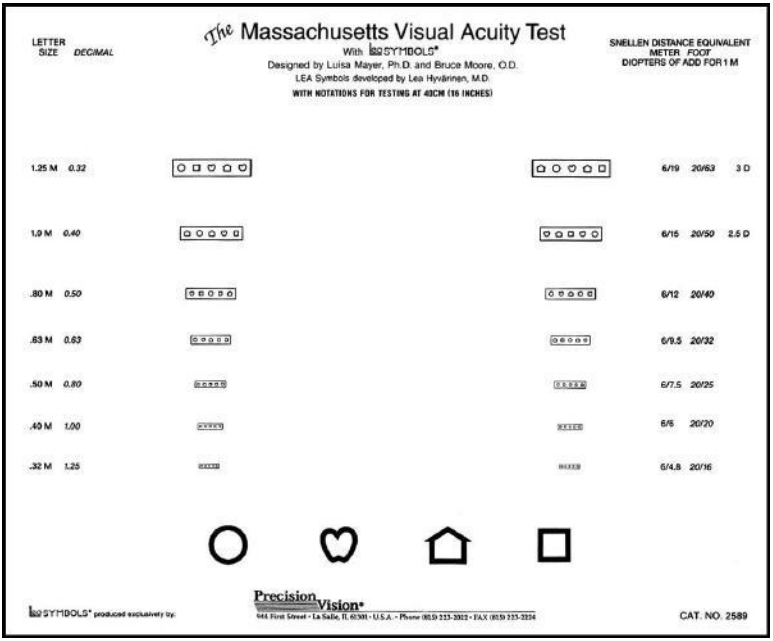
Uniocular and Binocular Assessment

If the vision is better when estimated binocularly may reveal that the binocular functions are represent.

If uniocular vision is recorded better then, that explains that the eye with poorer vision is interfering with the performance of the good eye. In that case the interfering eye may need to be occluded optically. A low vision child may usually show limitations of eye movements with, a head turn or nystagmus.

Visual Field Status

The status can be judged or estimated from the parents observations. Children born with visual disability despite poor vision have good mobility. They adapt to their residual vision and perform much better than an adult.



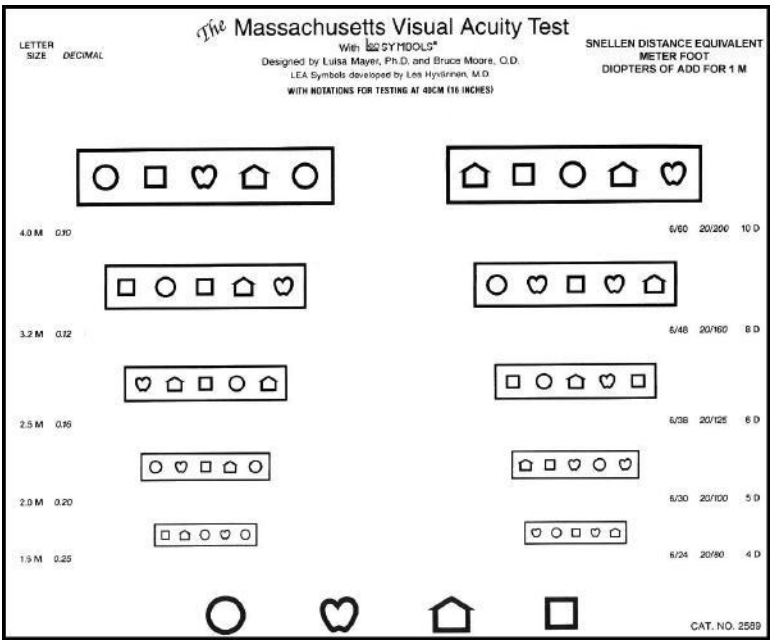


Fig. 13.8: Near vision acuity

Their visual field status is estimated on confrontation method. A *Nef perimeter* can also be used if available. It is like a Goldman perimeter with a translucent funnel which is hand held in front of the child's face. A blinking light target is flashed all around and the child has to catch or point towards that spotlight. Children with central scotoma may show head posture of eccentric viewing positions.

Nystagmus

It is common to find nystagmus in low vision child. Still common is the horizontal nystagmus. These children may not have saccadic functions of the eyes at all (the movement of eyes like when a person traveling in a moving train looking outside at objects out of the window). In case of nystagmus the opaque occluder should be avoided. If possible use a translucent occluder or introduce a blur by adding a high plus lens.

Accommodation

Since accommodation is a motor function it may not develop in some visually impaired children specially those with Down syndrome or cerebral palsy. This should be compensated by a proper plus lens.

Compliance

Parents have to be educated to understand the importance of the refractive error correction, occlusion and amblyopia. Follow ups are a must and compliance is important for ultimate gains of the correction of the refractive error.

Low Vision Devices in Children

Children show acceptance to the low vision devices, specially the congenital defect ones. The selection of the device will be just like an adult with some considerations in mind.

1. Mental maturity to use the device
2. Hand eye coordination

3. Type or category of eye pathology which will also classify the type of field defect—central, peripheral or overall blurred.
4. Devices for *infants*—best-corrected glasses and interesting colourful toys
5. Prescription for toddlers—Refraction, colorful toys that develop hand eye coordination like puzzles.
6. Device for *preschool child*—best corrected glasses, large print books to stimulate vision, coloring books, computer games, Bifocals can be considered
7. Devices for *school going child*—Stand magnifiers, hand magnifiers, monocular telescopes for blackboard. Bifocals may be for small print and encourage computer skills
8. *Older children*—will need bifocals or added reading glasses to read small print. Monocular telescopes are a must to see blackboard, both hand and stand magnifiers can be prescribed. CCTV or electronic devices may now be needed.
9. *Nonoptical devices*—These devices right from reading guides, writing guides to bold tip pens and bold line notebooks are required in all school going children. Lighting needs may be discussed and accordingly advised.
10. *Sunglasses or protective filters* should be considered in children with glare problems.

Reading Glasses and Children

Children usually have very good accommodation so a child with 6/60 vision also may read 12 font size for near. Reading glasses should be considered only when:

1. The child has fatigue on reading for long hours
2. The font size of the book print has gone smaller to that he can read.
3. The font size usually depends on the level/grade of the class child reads.
4. As far as possible ask the child to bring his/her school books to assess the size the child needs or the font size he requires to go upto.

Font Size and Everyday Reading Matter

Telephone directory	J1 or N5
News print	J4 or N 6
Children books – primary	N10, N12, N14 (depends on the class level)
Textbooks – middle	N- 12
Senior and higher secondary – text books	N 8
Invoices receipts	N12, N16
Type written print	N 10

Final Word After Child's Assessment

- Prescribe devices and check that the usage is proper
- Advise vision stimulation exercises
- Recommend or refer for rehabilitation services
- Educate and counsel the parents
- Ask for cooperation from school and teacher
- Follow up to add as the needs change.

EDUCATIONAL AIM

It should be our target to as far as possible provides optical/non optical devices to the child so that he/she can pursue the best form of education by going to normal schools and read print. Some cooperation from the school and the teachers, along with the parents initiative will help the child in overcoming the shortcomings. The parents of such children are also satisfied and happier. It is very difficult to convince the parent about their child's blindness and need for admission in blind school. We are also aware that considering the magnitude of the problem in our country, the number of blind schools is far to less. To reduce the burden we should try to strengthen whatever residual vision the visually disabled child has and try to achieve the target of vision such that the child can become a part of the normal school.

Recommendations to School

The dispensing of the visual aids is incomplete unless the recommendation or request letter is submitted to the School. Several times you may come across this complaint from the parents that the device advised is not allowed by the teacher in the class or the child is also shy as the he cannot understand as to why he is different from others. It becomes our moral duty to make them realize the goodness of helping and just modifying some routines for this child. As far as I have seen a request letter to the teacher helps in gaining our ultimate aim of letting this visually disabled child enjoy the benefit of education.

A sample of such letter written to the Class Teacher may be as follows:

The Class Teacher
XYZ School
ABC Road
FGH city

Dated: _____

Respected Teacher,

This is to inform you that – (name of the student _____) is suffering form Low vision. He/She is given her best corrected glasses and low vision devices. You are requested to make sure that the child uses these devices during the school hours.

You are also requested to make the following adjustments for this child and allowhim or her to:

1. Make him/her sit on the front bench at a distance of _____ meters from the blackboard.
2. Allow the child to use dark 2B, 4B, 6B pencils or Black bold tip pens for writing.
3. Minimise chalkboard to desk copying.
4. Allow him/her to use to bold line note books.
5. This Child needs more light to read and write. If possible position the seat near the window or allow a lamp light or an illuminated magnifier prescribed.
6. Use touch to guide and reinforce.
7. Allow a little more time to write. She/he may be slow in writing.

8. Be more verbal, Such as calling the student's name. She/he may not respond to your nod or pointed finger.
9. Include the child in all activities unless specifically advised not to do so.
10. Find opportunities for them to be in leadership and helping roles. Please convey this to other subject teachers also.

Your acceptance of the child will be a positive example for the class and the society.

Thanking you

Your Signature and designation
Low vision Centre

Vision Rehabilitation

14

What is vision rehabilitation ?

The answer is training and counseling after a low vision examination.

After the low vision assessment and prescription the low vision specialist needs to refer the patient for training and counselling.

Both ensure that one develops the skills and strategies needed to help him accomplish whatever goals one sets for himself — in all stages of life. It can equip one with techniques to maintain an independent lifestyle. Vision rehabilitation can enable the patient to cope with vision loss, travel safely, take care of your home, meet his/her career objectives and enjoy leisure activities. *In short, it can help him continue to do what he wants.*

A low vision specialist will prescribe devices to maximize your existing vision, but there's more that can be done. Other vision rehabilitation professionals can offer guidance with activities that you may no longer be able to do visually. This is why it's so important that the low vision examination addresses the specific needs of each individual. The *doctor may guide you to the tools, but rehabilitation counceller makes the tools work.*

Objective of Rehabilitation

To develop the independent living skills of visually impaired people and help them regain self-confidence for reintegrating into the community.

- Analyze the visual elements of a task so that the task can be modified and the environment adapted to the special equipment used
- Observe the visual environment and assess/observe the person under different environmental conditions. Vary aspects of the environment also, e.g. distance from the task, lighting, contrast, colour and time allowed
- Determine which sense is the most efficient for a particular task. For example, vision, enhanced vision, auditory, tactual, or some combination of these senses. Confident living is possible when you have the right skills.

Training Courses Usually Offered at Rehabilitation Centers are:

1. Orientation and mobility
2. Communicating in Braille
3. Home management
4. Entertainment like music
5. Counseling
6. Employment and placement
7. Usage of the low vision devices
8. Technology usage like computer software training courses.

These centers teach everyday tasks such as:

- Personal grooming
- Cooking
- Identifying money and keeping financial records
- Managing your medications
- Traveling safely.

These suggest:

Ways that visual functioning can be improved:

- Working in the best light
- Moving closer to objects to see them better
- Using objects with good contrast
- Allowing plenty of time for looking.

How a visually handicapped person can be helped?

Functional vision may be improved with training. Many people can learn to make better use of their low vision and can function

efficiently with only small amounts of visual information. To understand the specific implications of low vision for each person it is necessary to determine the activities normally done by the person with low vision and other people in the same community and what visual skills are required to carry these out. This may be at school, in the village, or at work. The person should be assessed in a place appropriate for those tasks.

FUNCTIONS OF A REHABILITATION COUNSELOR

The history, physical examination, functional assessments of vision, and evaluation of low vision aids come together with the patient's goals and diagnoses to allow for the development of a rehabilitation plan. The counselor should have the above information regarding the patient (Fig. 14.1).

The rehabilitation counselor should consider each of the following areas:

1. **General eyewear:** Should guide the patient when the prescribed glasses have to be used.

Fig. 14.1: The counselor makes the devices work

2. **Light and glare control:** Should explain him how to use filters or sunglasses or caps or visors along with the lighting conditions required for his working.
3. **Optical aids for use at near, distance and intermediate:** How the devices prescribed have to be used is reinforced by them?
4. **CCTV video magnification systems:** Where will the system be used and for what purposes? What features and magnification are required should be explained by them
5. **Visual field rehabilitation:** To teach the patient the scanning therapy and adaptive strategies.
6. **Computer usage:** They should guide regarding the technical computer adaptations or refer for technical support to centers which provide computer software training to visually handicap/blind.
7. **Patient and family education/counseling/psychological, psychiatric consultation:** Accepting change is part of the vision rehabilitation process. Often the hardest challenge is adapting to life with impaired vision. The councilor or an psychiatrist may be needed at times to help these patients and their families.
8. **Mobility and orientation training:** To teach orientation and mobility and equip one with techniques to maintain an independent lifestyle.
9. **Vocational counseling:** To refer the patient to a vocational rehabilitation counselor and help the patient for his disability certification and to further guide him regarding employment and Placements.
10. **School education:** To explain the recommendations to be made to teachers, the visual impairment teacher or the special education department. To guide the parents about the special schools for visually disabled in the area or locality.
11. **Funding issues:** What ways, and support from the government or NGO'S can the patient be helped in finding funding.

12. **Follow-up care:** To see that the patient follows up for evaluation and to an ophthalmologist and a low vision specialist

A low vision center is incomplete without a vision rehabilitation counselor. In case the Practitioner does not have the facilities to provide such help, they can be referred and guided to various rehabilitation centres in the country. One must be aware of such centers in their locality and have co-ordination with them. Certain advice regarding vision rehabilitation could also be guided by the low vision specialist during the prescription of the devices.

REHABILITATING THE CHILD WITH LOW VISION DEVICES (Figs 14.2 to 14.6)

Fig. 14.2: Child studying braille in blind school

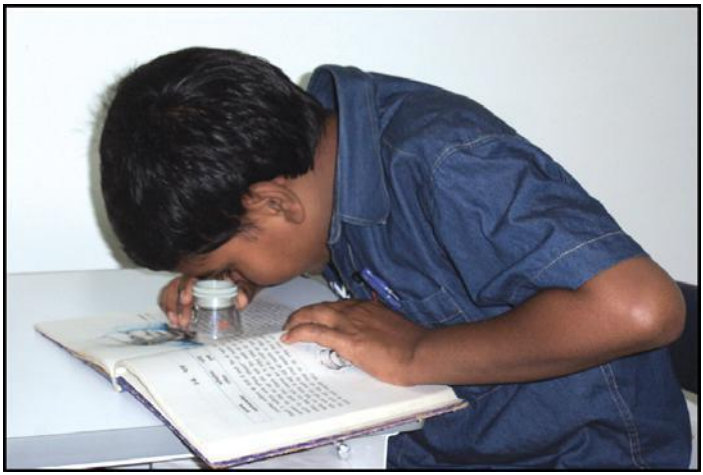


Fig. 14.3: Same child could read the print very well with optical devices

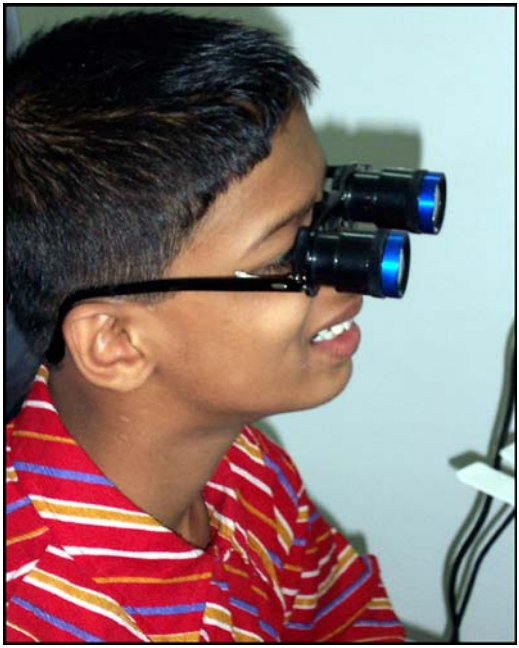


Fig. 14.4: Boy staying in blind school, had vision improved with telescope, he could read the blackboard at 3 m distance

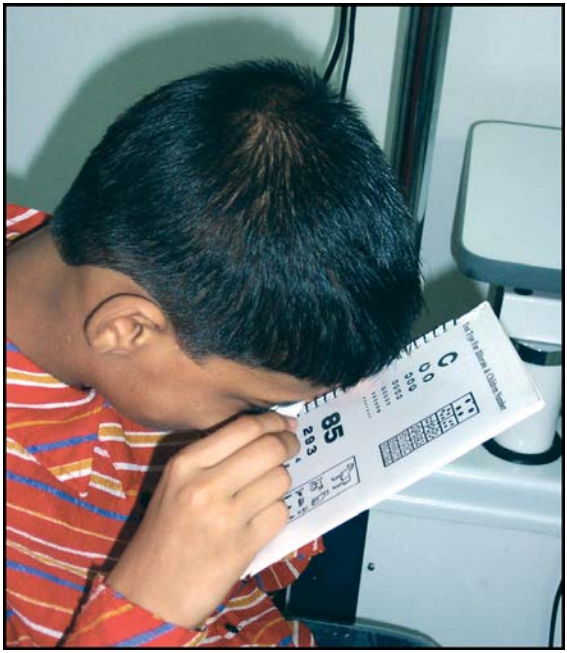


Fig. 14.5: Though he studies braille but had vision improved to N8 with optical devices

Fig. 14.6: Was independent with many independent living devices like talking watch

Establishing Low Vision Services

15

Low vision care can be provided in hospital, clinic, vision rehabilitation organizations and teaching institutions. Each will have to identify the level of low vision service they have to provide.

These low vision services can be offered at 3 levels—Primary, secondary and tertiary.

- **The primary level** should be done by community-based workers or any eye care professional who can identify and refer people with low vision to low vision service centre
- **Secondary level services** can be done at district level, which can include the basic low vision trial set which will cater to most basic needs of the patients
- **Tertiary level services** this will include the team of highly-skilled professionals and an advanced developed low vision care centre.

Low Vision Services

The essentials of low vision center are:

1. Trained personnel :
   - Ophthalmologist/optometrist and rehabilitation services
2. Infrastructure
   - Waiting room
   - Clinic/examination area
   - Rehabilitation area—referrals
3. Essential services
   - Clinical examination
   - Prescription
   - Dispensing

- Designing for specific needs
- Rehabilitation

Trained Personnel

These will include Ophthalmologists, optometrists, refractionist, ophthalmic technicians and Nurses. These personnel should be trained in taking visual acuity and doing refractions. They should also have basic training/knowledge of calculating the magnification, prescription of the devices and how to use them. The team should also include rehabilitation councilor to teach skills guidance regarding education, vocational and environment. The training should be included as a part of the ophthalmologist or optometrist curriculum.

Infrastructure (Figs 15.1 and 15.2)

Consulting room specially designed for low vision patients with waiting area is mandatory. The examination room should follow these basics:

- Color—light colored walls
- Contrast—Dark contrast colored door window boundaries, almirah, table, chairs etc with obvious contrast colour compared to the room wall colour
- Lighting—Natural light from window and Artificial controlled lighting system Dim, bright and very bright light
- Too much crowding of equipment and furniture should be avoided
- The floor should have markings in meters, indicating the distance from the patient's chair.

A separate room should be provided as instructional or **training room** for training in use in devices. A **counseling room** for patient rehabilitation should also be included.

The equipment required for the LVA clinic is

a. Refraction set
   - Trial set trail frame, occluder, and pinhole

b. Acuity charts for near and distance
   - Log MAR (ETDRS) charts for near and distance which can be used to record vision at 1 meter/2 meter/4 meter distance.

Fig. 15.1: Doors and furniture with bright contrast of low vision clinic

Fig. 15.2: Poor contrast blend of doors and wall of the low vision clinic

c. Visual acuity assessment in infants and toddlers
   LH picture test, Lea symbols, HOTV charts, Cardiff charts
   LH children's continuous test cards, Teller's VA charts etc.
d. Functional tests Like contrast sensitivity charts
e. Perimeter—Amsler's charts and Goldman perimeter
f. Trial set of basic optical aids (listed separately)
g. Set of basic nonoptical aids (listed separately)
h. Electronic system (CCTV) for demonstration
i. Computer system for demonstration of computer software for low vision patients
j. Other assistive technology devices.

STANDARD LIST FOR LOW VISION SERVICES: VISION 2020

The low vision working group of vision 2020 has endorsed a standard list of ophthalmic equipment, vision assessment equipment and low vision devices at secondary and tertiary level.

Equipment/device	*At tertiary level*	*At secondary level*
Streak retinoscope	yes	yes
Direct ophthalmoscope	yes	yes
Foci meter	yes	yes
Trial lens set	yes	yes
Trial frame	yes	yes
Long handle occluder with pinhole	yes	yes
Cross cylinder +0.5/1.0	yes	-
Pen torch	yes	yes
Log MAR test charts Letter, landoltC's or tumbling E, lea Symbols	yes	yes

Contd...

Contd...

Near vision test charts Single letter Continuous	yes	yes
Contrast sensitivity test charts	yes	-
Color vision test	yes	-
Amsler Grid	yes	-
Perimeter	yes	-
Light box for visual acuity assessment	yes	-
Spectacle magnifiers	5 to 12 D in 2 D steps with basein prisms 10 to 40 D in 4 D steps 10 to 40 D in 4 D steps	6 to 12 D in 2 D steps 16 to 20 D in 4 D steps
Hand magnifiers/ Self-illuminated	5 to 42 D (15 pieces)	5 D to 17 D (5 pieces)
Stand magnifiers/ illuminated	13.5 to 56 D (9 pieces)	13.5 to 40 D (6 pieces) non illuminated
Dome and Bar magnifiers	4	2
Telescopes monocular	2.5X, 3X, 4X, 6X, 8X, 10X	4 shades with UV protection and transmission of 40%, 18%, 10% and 2%
Filters	5 shades with UV protection and luminous transmission of 40%, 18%, 10% 2% and 1%	-
Black and white hand held CCTV magnifier Full colour CCTV magnifier	yes	-
Computer devices With software with text enlargement and voice output.	yes	-
	Cost approx = 7 lacs	Cost approx = 2 lacs

BASIC NONOPTICAL DEVICES FOR LOW VISION PATIENTS

1. Reading Lamp—long arm adjustable with 60 W bulb and with 11 W fluorescent tube.
2. Reading stand
3. Reading guide
4. Writing guide
5. Signature guide
6. Bold line paper
7. Felt tipped pen
8. Notex
9. Needle threader
10. Large print playing cards
11. Large print notebooks.

The basic list for low vision care includes (Fig. 15.3):
Primary level trial set can be included as part of routine eye clinic. Most of the patient's problems with low vision can be dealt with this basic trial set Approx Cost = Rs. 5,000 to 10,000.

Fig. 15.3: Trial set of optical and nonoptical devices

1. Pen torch.
2. Vision assessment charts—near and distance ETDRS for low vision patients.
3. Four hand-held magnifiers from 5 to 14 D.
4. Four stand magnifiers 13.5 to 40 D.
5. Two telescopes (monocular) 4X and 6X.
6. Magnifying high plus add glasses—powers like +5.0DD, +8.0D, +10.0D, +16.0D, +20.0D, +24.0D can be made with plastic aspheric material or else the routine trial set lenses can be used to calculate the higher adds.

Understanding People Who are Visually Impaired 16

Some myths and suggestions for visually impaired which should be explained and communicated to the patient and relatives.

1. The brightest possible light is not necessarily the best.
2. Visual effort will produce no ocular damage. There may be an initial fatigue which will overcome by regular usage.
3. The more the visually impaired person uses his residual vision, more the brain will interpret.
4. While advising all optical aids: Holding it closer or at wrong postures will not damage your eyes.
5. Sit in natural day light and read initially till you get adapted to the low vision device.
6. Sitting close to TV at a distance which is comfortable for your eyes will not damage your eyes.
7. It is not wrong to squint and view the faces or objects. (This should be encouraged in patients with central scotoma).

Understanding their problems (Fig. 16.1)

1. The impaired person waits for someone else to provide information.
2. He needs more time to do the task.
3. He depends more on your verbal remarks.
4. Do not always place objects in the person's hand. The person should be encouraged to look for the object and reach out for it.
5. To make them adapt to their environment, ask relatives and friends to explain and describe objects and things happening. Describe these things in words that the person can understand.

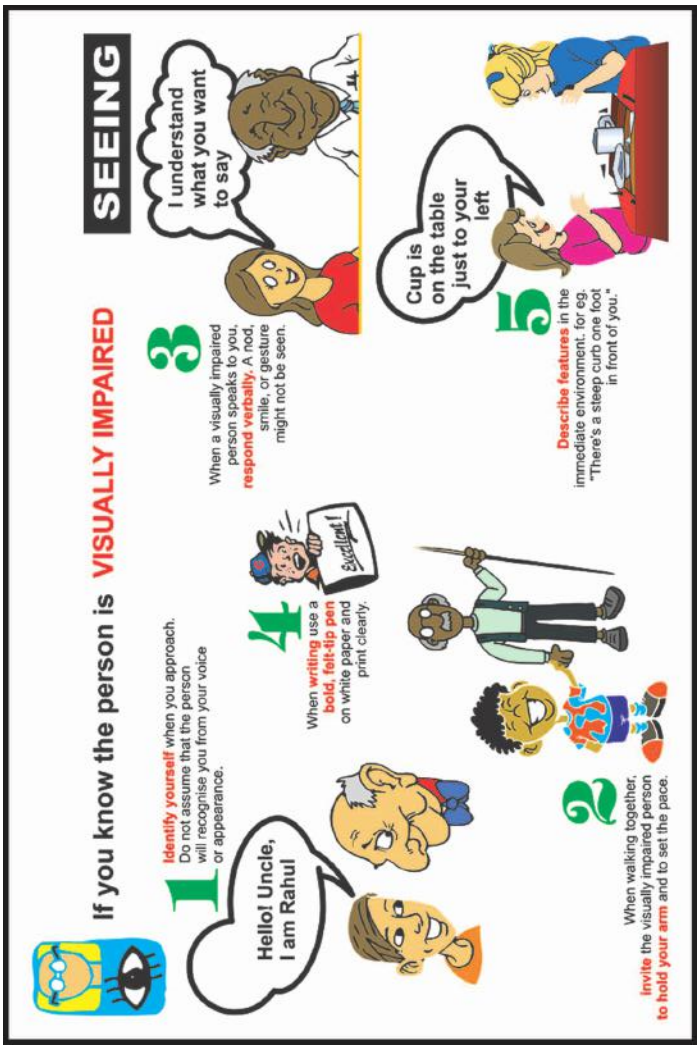


Fig. 16.1: Communicating with people who have trouble

6. Show the person where things are kept at home, in the school.
7. Make them independent by encouraging the person to take part in all family and community activities.

8. Describe yourself when you enter the room or leave a room as they may not be aware of another person nearby or in a room.
9. Provide objects or materials that make activities easier, for example, use a light colored plate or bowl on a dark mat; choose good contrasting colours.
10. People with certain eye conditions are nearly blind at night or in dull light. They may not have enough vision to move safely by themselves or do their normal activities that they could do during the day. They may need extra help to move safely at night. A torch or flashlight is useful.
11. It is often difficult to see steps or changes in the level of floors or the ground. Changes in levels can be marked, for example, the edges of steps marked with paint to show the edges.
12. Larger objects are not always easier to see. For some people with reduced visual fields, they can only see parts of large objects.
13. Objects are usually easier to see when they are close. Objects which are too small or have poor contrast may not be seen even when very close. Children can usually see objects held very close (10 cm or even less) to their eyes. Adults (especially when over 35 to 40 years old) cannot see objects held very close to them.
14. Some things can be recognized by their color even if details cannot be seen like the fruit in the fruit basket.
15. Bright sunlight and objects can increase a person's ability to see an object.
16. Speckled light falling on the blackboard hinders readability.
17. Glare makes it difficult for all people to see. The light in the environment and on objects can affect how well objects can be seen.

VISION THERAPY

Vision is a learned and developed skill that requires stimulation and experience. Like learning to walk and talk, children must

learn how to use their vision. The visual system interacts with the muscles of the body to develop reaching, crawling, grabbing and walking. In fact, two thirds of the functions of the brain are associated with vision.

1. *An new born* who is unable to focus their eyes on wherever they are looking or show difficulty in near range focusing should be given glasses corrected for near. The infant's behavior and motor response will also improve.
2. *A 3-month infant* who does not watch movement of his own hands could be given therapy of training him to do so, by giving bright colored objects to hold or putting on mittens of bright color enabling the child to track his hands.
3. Similar initiative of promoting the child to hold objects or toys of high contrast and bright colors should be taken as a part of vision therapy.
4. More near activities like colours, blocks, and puzzles should be offered to the child to play with (Fig. 16.2).
5. *To a preschool and above,* bright picture objects can be flashed on the computer screen and the child asked to attempt and point at it (Fig. 16.3).
6. Childs mobility should be attempted or improved by chasing a ball or if possible play with a pet (Fig. 16.4).
7. It is important to provide the child with a stimulating environment using bright colors and appropriate illumination.
8. To facilitate optimal learning, present play material to the child in the preferred region of visual attention. Remember that the human face is the most appropriate stimulus to promote visual development.
9. Contrast enhancement exercise at this age, children are primarily interested in high contrast objects.
10. Children are not visually interested in looking at objects that are too far away. For example, they may not look at room borders close to the top of the wall, as it is too far away.

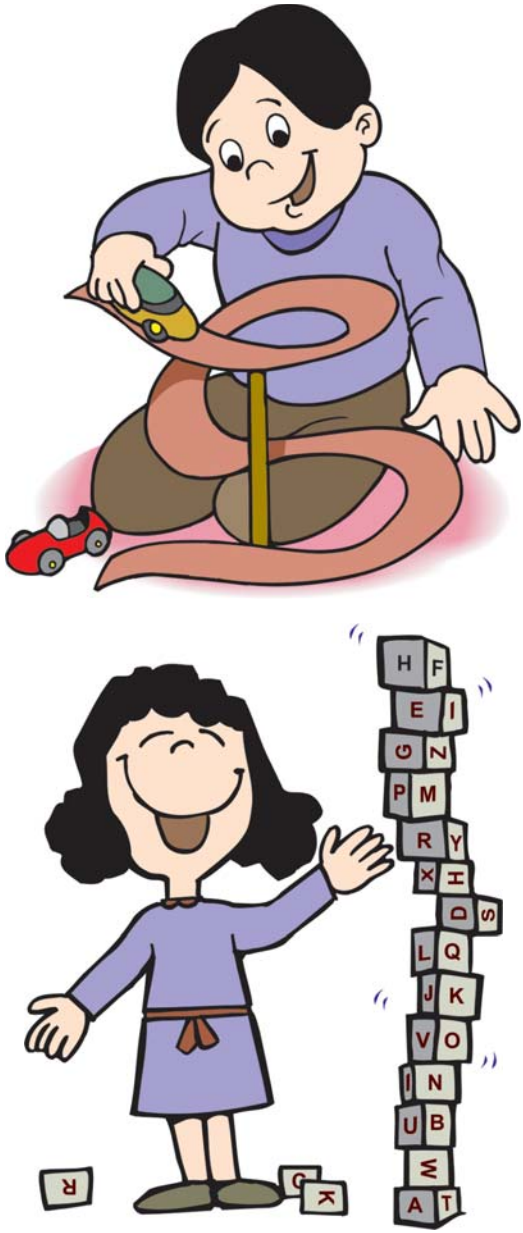


Fig. 16.2: Playing with toys improves their hand-eye coordination

Fig. 16.3: Vision therapy with computers

Fig. 16.4: Encourage the child to play with bright colored ball

Things to do to Enhance Their Vision

- Place high contrast objects, such as black and white stuffed animals, just beyond the reach.
- Decorate the room in a visually stimulating way, using high contrast mobiles, toys and fabric.
- Use black and white or red and white patterns.
- Keep the room well lit. At night, leave on a small night light with a 25-watt bulb so that if your child wakes up, the light will provide stimulation.
- Move the crib to different positions in the room so that the child will experience different views of the room.
- Talk to your baby when you enter the room so she will know you are there.
- Use brightly-colored tape around your child's bottle to create a high contrast target.
- Using a flashlight, encourage the child to follow the light source.

It is well established that vision stimulation is critical for proper and normal development of the visual centers of the brain. Often visual stimuli are paired with tactual stimuli or/and auditory stimuli to try to attract the visually impaired child's attention to object(s) of interest.

Be-Active Box — A Tool for Early Intervention

Children with visual impairment and/or additional disability are placed in a Be-Active Box, which is cut off from outside noise. The child can therefore listen to the sounds that she makes when moving about and touching the objects suspended in the box. This enables the child to learn that movement will lead to contact with objects, exciting curiosity and interest. This facilitates exploration, helping the child become an active learner rather than a passive listener.

The Be-Active Box should have interesting objects like beads, bells, keys, and spoon; crinkle paper, etc. hung with strong elastic from its roof and along the sides. These objects should be at a level where the child will come in contact with them.

Objects should be graspable. They should have contrasting texture. Sound -producing objects like beads, bells, metal and plastic spoons bunches of keys, etc are useful Movement of the arms and hands result in a gradual awareness in the child.

The child starts to consciously push or touch objects and watch/wait for the sound or movement to be produced. He Learns to grasp and release objects.

All this eventually leads to comprehensive exploration and learning.

Child and Toys

Placing a colorful toy against contrasting background helps a child distinguish the shape and form of the object. Do not overwhelm a child with a wide selection of toys. Present each toy individually. Do not be upset if a child with impaired vision uses a toy in an unusual way.

Each child has a unique working distance or position that provides the best view of the material. In a playful way, present objects at different distances and positions to discover how he or she responds. Then use this information to stimulate visual attention by presenting other toys.

Books are Also Toys (Figs 16.5 and 16.6)

It is vital to remember the importance of books for children of every age. They provide information and help to promote vision skills, language development, and listening skills. With infants, for example, the first goal in using a book might be to encourage them to focus on an image.

Books with large pictures that can be clearly distinguished can be used for children with low vision.

Activities to Encourage the Use of Vision Exercises for Hand-Eye Coordination

1. Hold an object close to the child's face and move it slowly and put it down in front of them. The movement of the object should be followed with the eyes and encouraged to catch it.

Fig. 16.5: Books are also toys

Fig. 16.6: Encourage to draw and color

2. Bouncing or rolling a ball and hitting it with the hand.
3. Tracing over or copying patterns of straight or curved lines. Dot-to dot patterns, start with dots 1cm apart up to 4 cm apart.
4. Encourage him to identify bright images or play games on computer.

Classroom Modifications

- Take your seating position in the front row of the class to view the blackboard clearly.
- You will need to take additional time to complete tasks and assignments. Requesting for additional time during examinations is legally permissible.
- Use black ink, as it has a high contrast and it is Easier to read.
- Utilize natural light to make use of the residual vision by sitting near an open window. A desk lamp may also be useful.
- Try using alternate modes of learning like taped books or large print materials and for additional support use a scribe or a reader whenever required.

Encourage the student to strive to reach their full potential utilizing the talents and capabilities, yet also to be realistic in selecting career goals.

Making Text Legible for Visually Impaired

Contrast and Type Color

Visually impaired patients can read the text better with maximum contrast, like a black on white or white on black background. Based on this all patients with low vision should be explained the advantage of increasing contrast in text. For students traditional blue ink pen can be replaced by black bold tip pens and pencils can be replaced from normal HB to 2B, 4B OR 6B (the darker and softer leads).

If working on computer the screen background can also be selected to enhance the contrast.

Point Size

It is generally seen that 18 point than 9 point of the usual print size is read by most of the visually impaired patients.

Spacing

If the spacing between the text-lines is one and a half or double line spacing the print is read easily by low vision patients. They may not have difficulty then in finding the beginning of the next line.

Font Selections

Decorative or cursive fonts are difficult to read. The best is the bold times new roman or standard serif fonts. Italics are again not preferred. As far as possible the font should be selected such that the space between each alphabet is better spaced.

Paper Finish and Distinct Covers

Glossy finish paper can cause glare problems and may not be as easy to read. Bright colored covers make it easier for the visually impaired to identify.

The low vision exam marks the beginning of a challenging journey. With the proper tools and guidance, plus his own and his families resourcefulness and determination, *success is assured*.

Disability Network in India

17

FACILITIES AND BENEFITS

Included here is a description of the help provided by statutory services for persons with disabilities. Several ministries/ departments of the Government of India provide various concessions and that include.

Concessions on Railways

Railways allow disabled persons to travel at concession fares up to 75 percent in the first and second classes. Escorts accompanying blind, orthopedically and mentally handicapped persons are also eligible to 75 percent concession in the basic fare.

Air Travel Concessions

Indian Airlines allow 50 percent concession fares to blind persons on single journeys.

Postage

Payment of postage, both inland and foreign, for transmission by post of 'Blind Literature' packets is exempted if sent by surface route.

Customs/Excise

Braille paper has been exempted from excise and customs duty provided the paper is supplied direct to a school for the blind or to a Braille press against an indent placed by the National

Institute for the Visually Handicapped, Dehradun. All audiocassettes recorded with material from books, newspapers or magazines for the blind are exempt from custom duty. Several other items have also been exempted from customs duty if imported for the use of a disabled person.

Conveyance Allowance

All central government employees who are blind or orthopedically handicapped are granted conveyance at 5 percent of basic pay subject to a maximum of Rs. 100 per month.

Educational Allowance

Reimbursement of tuition fee of physically and mentally handicapped children of the Central government employees has been enhanced to Rs. 50/-.

Income Tax Concession

The amount of deduction from total income of a person with blindness, mental retardation or permanent physical disability has been increased to Rs. 40,000/-.

Award of Dealership by Oil Companies

The Ministry of Petroleum and Natural Gas has reserved 7.5 percent of all types of dealership agencies of the public sector companies for the orthopedically handicapped and blind persons. However, persons with visual handicap are not eligible for LPG distribution. Similarly, the Ministry has also reserved 7.5 percent of such dealership/agencies for defence personnel, and those severely disabled either in war or while on duty in peacetime.

Posting

Candidates with Physical handicaps, appointed on a regional basis be given as far as possible, appointments as close to their native place.

Economic Assistance by Public Sector Banks

All orphanages, homes for women and persons with physical handicaps as well as institutions working for the welfare of the handicapped, are given loans and advances at very low rates of interest (4% under DRI) and a subsidy of 50 percent up to a maximum of Rs. 5,000/- is also admissible. State Governments/Union Territories also give concessions/facilities such as reservation in jobs, scholarships, old age pension, free travel in buses, etc.

GOVERNMENT REHABILITATION SERVICES

The Ministry of Social Justice and Empowerment is the nodal agency of the Central Government that promotes services for the people with disabilities through its various schemes.

OBJECTIVES

The primary object is to promote services for people with disabilities through government and non government organizations, so that they are encouraged to become functionally independent and productive members of the nation through opportunities of education, vocational training, medical rehabilitation, and socioeconomic rehabilitation.

Emphasis is also placed on coordination of services particularly those related to health, nutrition, education, science and technology, employment, sports, cultural, art and craft and welfare programs of various government and non-government organizations.

- District Rehabilitation Center (DRC) Project
- Regional Rehabilitation Training Center (RRTC)
- National Information Center on Disability and Rehabilitation (NICDR)
- National Council for Handicapped Welfare
- National Handicapped Finance and Development Corporation
- Assistance through Overseas Development Administration, UK
- Training in the UK under the Colombo Plan

- UNICEF assistance in collaboration with the Government of India.

National Awards

On the occasion of the World Disabled Day every year, the President of India gives away National Awards to:

- The Best Employee
- The Best Employer
- The Best Individual
- The Best Institution
- The Best Placement Officer.

ACTS IN DISABILITY

- The Mental Health Act
- The RCI Act
- The PWD Act
- The National Trust Act.

GRANT-IN-AID SCHEMES OF THE MINISTRY OF SOCIAL JUSTICE AND EMPOWERMENT

The different grant-in-aid schemes offered are:

1. Assistance to Voluntary Organizations for Disabled.
2. Assistance to Disabled Persons for Purchase/Fitting of Aids/Appliances.
3. Establishment and Development of Special Schools (Fig. 17.1).

National Institute for the Visually Handicapped

Address:
116 Rajpur Road, Dehradun - 248 001, Uttaranchal, India
Phone: + 91 135 274 4491

NIVH is under the Ministry of Social Justice and Empowerment. It is involved in Human resource development. Activities include:

- Designing and delivery of model services
- Designing, production and delivery of assistive devices
- Research and development

Fig. 17.1: Development of special schools

- Production and circulation of books in Braille and audio forms
- Consultancy services to Government and voluntary organizations, and
- Documentation and dissemination.

NATIONAL ASSOCIATION FOR THE BLIND—NAB

The rehabilitation programs at NAB focus on transforming the lives of the visually-challenged men and women.

Under this:

1. The center renders a wide range of services to school-going children such as:
   - Provision of large print text books
   - Parental counseling
   - Coordination with principals and teachers
   - Training in orientation and mobility Equipped with the latest software and reliable technology from microsoft.
2. NAB Hadley India Service is collaboration between the Hadley School for the Blind, USA and NAB to provide higher education, and as a result better job opportunities to the blind.
3. There are at least 9 million blind people in India of which about 3 million are blind children of school going age. But

only a fraction of them are fortunate enough to receive education.

To better this appalling scenario, NAB, through the Education Department, started the concept of Integrated Education in the rural areas in the country.

Supported by international agencies like Sight Savers, Danida, NORAD and Share and Care Foundation the Programme continues to bring more and more children.

Braille Kits

At the IE programs that are held in different parts of the country Braille kits are given out which contain aids and appliances needed by young students.

Aids and Equipment

NAB provides everyday usable items of interest, study and necessity. Needy individuals are provided with a Braille typewriter, Braille playing cards, special watches and talking watches, cricket balls with jingle bells.

Talking Books (Fig. 17.2)

Building on their listening skills, the NAB offers technology driven "Talking Books" for the blind.

Training Center for Teachers of the Visually Impaired (Primary)

This is a one-year program recognized by the Rehabilitation Council of India.

Employment and Computer Training (Fig. 17.3)

The department offers three types of employment programs depending upon the education, literacy and skill-set of individuals.

- Open Employment, Self-Employment, Home Bound Programme.

Fig. 17.2: Talking books and library

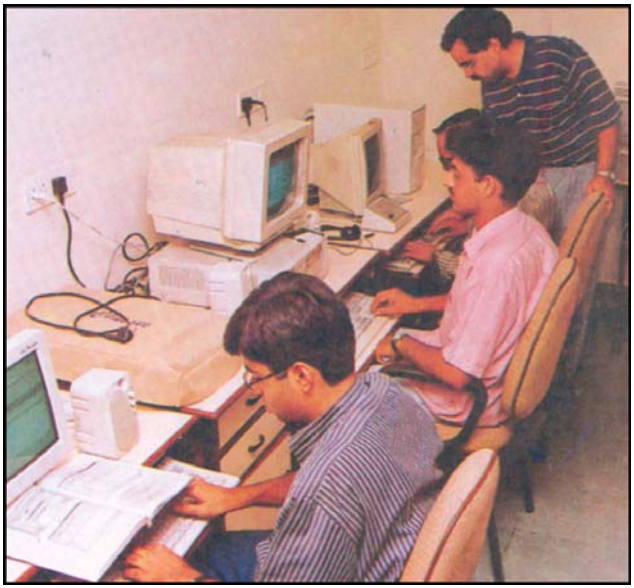


Fig. 17.3: Computer training

Self-Employment (Fig. 17.4)

This program aims to help the blind become entrepreneurs for small businesses. The Department identifies potentially

lucrative sites and liaisons with government bodies like Traffic Dept, Municipal Corporation, Telephone authorities and Donors for setting up:

- Vending stalls
- Handicapped public call offices
- STD/ISD kiosks

Computer training has enabled the blind to browse the Internet and carryout word processing functions in addition to reading printed material. There is also a facility for Braille Transcription of any matter if required.

Some Rehabilitation Centers in India

Blind Peoples Association
Dr Vikram Sarabhai Road, Vastrapur, Ahmedabad,
Gujarat, 380 015, India.
Tel: +91 79 630 5082; Fax: +91 79 630 0106
Email: bpa@vsnl.com; Web: www.bpaindia.org

Blind Relief Association
Lal Bahadur Shastri Marg, New Delhi 110003,
India. Tel: +91 11 360847; Fax: +91 11 352471
Email: lbsbra@delhi1.mtnl.net.in

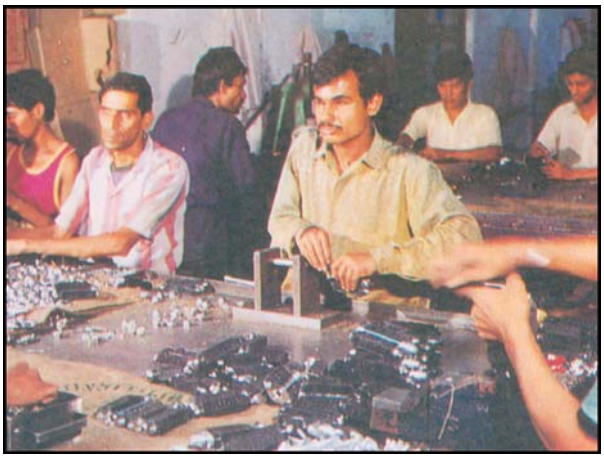


Fig. 17.4: Self-employment

Helen Keller Institute
Municipal Secondary School, Ground Floor, South Wing, Near 'S' Bridge, NM Joshi Marg Byculla (W), Mumbai 400011, Maharashtra State, India.
Tel: +91 22 3087052; Fax: +91 22 2872735
Email: hkidbind@bom5.vsnl.net.in

International Council for Education of People with Visual Impairment (ICEVI), IHRDC Campus, Ramakrishna Mission Vidyalaya, Coimbatore - 641020, India.
Contact person: Dr. M. N. G. Mani, Secretary General
Tel: +91 422 697530, +91 422 693414
Fax: +91 422 692353,
E-mail: secretary-general@icevi.org
Website: www.icevi.org

National Association for the Blind (NAB)
Sector 5, R.K, Puram, New Delhi 110022, India.
Tel: +91 11 617 5886; Fax: +91 11 301 0917
Web: www.nabin.org

National Institute for the Visually Handicapped
522 Trunk Road, Poonamallee, Chennai - 600056 (South India), India. Fax: +91 44 627 4478
Email: nivhchen@tn.nic.in

Society for the Visually Handicapped
Apt 1-B, 12 Dover Road, Kolkata, 700 019, West Bengal, India. Tel: +91 33 475 9581
Fax: +91 33 476 211; Email: svh@vsnl.com

The national centre for promotion of employment for disabled people—NCPEDP
www. ncpedp.org
India's first web site concerning employment of disabled people.

Some Patient Stories

18

Seven-Year-Old Boy, Student 1st Standard– Albinism

He and his younger brother 6 months old suffers similar problem. He has started with reading blackboard problem at school now. Glare has always been his problem and he never played like other boys outdoors. He preferred to watch TV and his anxious parent's objected to his close sitting. He had no reading problems, but his parents were not happy at his bending over to books.

On assessment his distance vision was 3/19 both eyes which improved to 3/15 each eye with. (RE = -2.5/ -2.0 axis 10 : LE -2.50 Dsph/-2.0 DC Axis 170) The refraction was done under homide 2 percent eyedrops. His near vision was 1M or N 8.

The child is prescribed distance glasses B2 *tint* for outdoors and medium pink for indoors. The child is using a *4x specwell monocular telescope* for blackboard, which improved his vision to 6/9. He also wears *peak cap* while moving outdoors. His near vision is adequate for his level of class.

He is advised a *slant reading table* to give him comfortable posture for prolonged reading. He also uses dark 4B pencils for writing. His teachers have been explained about his vision status and requested for cooperation.

Comments

The parents have been assured that this child can have his education like a normal child and will be able to lead an independent life. Tackling glare problems helps these patients, and fortunately the vision does not deteriorate with age.

The family is also referred for genetic counseling.

Fifteen-Year-Old Male Student 10th Standard – Heridomacular Degeneration

This child had started noticing problems in distance vision 2 years back and his difficulty was gradually increasing. He reported problems in seeing faces, and that he had to sit on the front bench to be able to read the blackboard. His concern was near vision and inability to read small print in the books. He needed more light to read and that too preferred fluorescent light. He was bending too close to write. He had no mobility problem but was disturbed by glare and felt reduced vision outdoors.

The parents were concerned about further decrease in vision.

On evaluation his distance vision was 3/19 and 3/12. His unaided near vision at 25 cms was 5.0 M and 2.5 M. (N20)

His amsler showed central field defect in the right eye, his LE amsler was normal.

This child was advised *3x monocular telescope* for distance. With this he improved to 6/9. *Medium grey filter* was advised for outdoors. His near vision improved to (N 6) 0.8 M with + *5.0 Sphere both eyes with base in prisms.* He preferred a *self illuminated stand magnifier of 2.5 X power* for long hours of reading. This was less strenuous. A *slant reading table* with a *fluorescent lamp* was also advised. He was referred to NAB for *talking books* so that he could prepare for his board exams. His disability certificate was also given to take advantage in getting extra time during the exam.

This child and parents needed counseling from a *rehabilitation counselor* who could discuss his progressive condition and guide him regarding his education and employment later.

Comments

Patients with dense, wide area of central field loss in advanced stages may benefit from stand magnifiers compared to the high plus reading glasses. In stand magnifiers they can use their peripheral vision to the best to read.

Forty-Three-Year-Old Male – High Myopia with Chorioretinal Degeneration, Bank Employee

This man had progressive myopia since his school days. Since last 2 years he had started developing problems in near vision. Due to this he was unable to work with account books at office as he was never sure of the numbers. He did report that he could see the small print clear without glasses but was afraid to do so as it might reduce his vision further to work without glasses. His other concern was inability to read the small font size on the computers during work. He had satisfactory vision to see faces and identify people, though he was unable to see very far off objects now.

He was concerned about his disability in doing office work, which may force him to take voluntary retirement and was mentally disturbed and anxious about it.

On assessment his best corrected vision was 6/36 in RE with -11.50/-2.0 Dcyl at 60 and his LE vision was 6/18 with -10.50/-2.0 D cyl at 120. His near vision was N/36 or 4.0 M .He was not wearing presbyopic correction. His contrast vision had reduced considerably.

He is prescribed a *bifocal glass* with + 3.0 D sph addition which gave him reading vision of 1.0 M or N 8 at 25 cms distance. For very fine reading a *pocket 3x hand magnifier* was also prescribed which gave him 0.4 M near vision. He was explained about the need for better *lighting* at work. He was assured that he could *remove his glasses* for short intervals and bring the books close to read at 15 cms. He was asked to use a *black pen* at work to improve contrast. A *Typoscope* specially made for his ledger books was also given to reduce glare and improve contrast. For his computer task he also uses *magnifying software*. He is a satisfied man and continues his job.

Comment

High myopes have best vision for near without glasses. Removing them and reading at the focal length is just like giving high plus additions.

Ten-Year-Old Male – Congenital Glaucoma – Discontinued School

This boy from a village was suffering from congenital glaucoma and had progressively decreasing vision despite best possible treatments. His mobility was also a problem now especially outdoors and he could not cope up with school due to very poor vision. He had no difficulty in moving indoors and doing his own work.

He suffered from glare also. The parents were anxious and wanted that he should be able to continue his schooling so that he can have a decent and independent living.

This child's vision was recorded as 1/60 in RE and 1/20 in LE. His near vision was 10 M/N 80 in left eye. His contrast was very poor. He had only 10 degree temporal fields in left eye. RE had some seeing area but the vision was very poor to perform a Goldman perimetry.

There was no improvement of vision with glasses, and telescopes for distance. His field and contrast were already so poor that reduced field of telescopes did not help him.

The near vision was best improved to N/36 4.0 M by a 6x stand magnifier but the reading speed was so slow that with only one alphabet at a time which was not practical to cope up with education at normal schools. A CCTV gave him his reading vision but the parents could not afford it, moreover the eye disorder may progress to further vision loss and CCTV may be useless then.

This child needed *rehabilitation and was referred for education to a school in for visually impaired.* There was no such school in their locality so he now studies in a school in the city near his village. He lives in a hostel and is taught Braille there. He also visits the hospital for regular eye check ups and medications.

Comment

Patients with very poor vision, fields and contrast acuity may not improve with optical devices and have to be referred for rehabilitation.

As such *in early cases of glaucoma* increased illumination and magnifiers are a great help. Filters should be advised to prevent glare. High plus reading glasses are also useful provided the field loss is not extensive.

Fifty-Five-Year-Old Male Diabetic Retinopathy – Principal of An Educational Institute

This man comes to us without any hopes. His 15 year old diabetes had led to reduced vision and inability to work now. He was under medical and ophthalmologic supervision for his control of diabetes and maculopathy.

He had 3 years to retirement and wanted some device to read his documents in office. His main need was reading which continued for almost 8-10 hours a day.

He had several optical devices with him like the magnifying glasses of 10 Diopters and a hand magnifier of 3 X power. He was not satisfied with his reduced working distance with near glasses which caused him lot of eye strain and was able to read the fine print only with the hand magnifier and the spectacles.

His distance vision was RE: 2/60 and LE vision was 6/24. His LE near vision was 6.3 M/N 50 RE near vision was very bad due to dense central scotoma. His contrast acuity had reduced considerably and the amsler showed isolated scotoma which was due to maculopathy and laser treatments. His near vision was 2.5 M/N 20 with magnifying glasses and N 8 with added hand magnifier.

This patient is explained the need of glare reducing glasses for outdoors, along with advice regarding increased illumination at work place. The tips on enhancing contrast are also given.

He was demonstrated the use of a *CCTV system* at our clinic. He now possesses one at his work place and is satisfied that he can continue his reading work for long hours. For his writing work he continues to use his high plus glasses. He also uses a talking glucometer for his insulin injections.

Comments

Closed circuit video magnification systems are capable of higher levels of magnification and can manipulate the brightness and contrast of the image New innovations in CCTV technology are expanding their use and availability.

Forty-Seven-Year-Old Male – Professional Accountant Homonymous Hemianopsia

It occurred after his he had a road accident. The field loss improved in the first few months. Unfortunately, most homonymous hemianopsias do not resolve, and thus leave the patient with a permanent disability.

Patient reported running into objects, tripping, falling, knocking over He become so fearful of falling or running into objects that they may be unwilling to travel or shop without assistance, objects suddenly appear, often startling the patient. He could only shave one side of his face. He could only read headlines. With left homonymous hemianopsia he reported missing the beginning of a line text. He had problems moving from the end of one line to the next and often do not move back to the very start of the line.

Assessment: His best-corrected vision is 6/24 each eye and 2.5 M (N/20) for near.

Treatment scanning therapy is performed through either the low vision specialist or through occupational therapists to train the patient to better compensate for the loss of visual field. Many common activities like table tennis have been found to be helpful to patients learning to scan.

Patient would not be able to return to drive. To solve his reading problem Simple boundary marking with a well placed thumb will also reduce this problem. A +6.0 Dsph near vision glass improved his near vision to N/10, which he used for writing. For his fine reading he used a 3x hand magnifier along with the reading glasses.

For computer work he preferred the talking software. He uses a talking mobile phone also.

So, with proper training and the use of low vision aids he is able to return to independent life.

Appendix 1

SUPPLIERS, MANUFACTURERS IN LOW VISION CARE

Some Addresses for Optical Aids Procurement—India

1. Baliwala and Homi Pvt. Ltd.
   614, Jagannath Shanker Sheth Marg
   Dhobi Talao
   Mumbai - 400 002
   Ph.: 2014906, 2054385
   Fax: 022-2064363
   Baliwallahomi@vsnl.com
2. Lensel Optics Pvt. Ltd.
   66/2, D2, MIDC, Chinchwad
   Pune - 411 019
   Ph.: 91-20-56111722, 27474581, 27474340
   Fax: 91-20-56111721
   E-mail: lensel@pn2.vsnl.net.in
   lensel@vsnl.com
3. Shah and Shah
   2, Russel Street
   Calcutta - 700 071
   Ph.: 22265328, 22464687
   Fax: 0091-33-22261730
   E-mail: shahandshah@satyam.net.in
4. L.V. Prasad Eye Institute
   L.V. Prasad Marg, Banjara Hills
   Hyderabad - 500 034
   Ph.: 040-3542790

5. Vision Enhancement Centre
   Near Shahibaug Underbridge
   Ahmedabad - 380 004
   Ph.: 91-79-2865537
   Fax: 91-79-2866381
   E-mail: visionenhancementcentre@rediffmail.com
6. Om Tao Scientific Apparatus
   3-2-320/2, Chapal Bazar,
   Kachiguda, Hyderabad - 27
7. Sonam Low Vision Centre
   56, Ballygunge Gardens
   Kolkatta - 700 019

Non-optical Devices

1. NIVH—National Institute of Visually Handicapped
   (for non-optical aids)
   NIVH Dehradun
   151-5, Rajpur Road,
   Dehradun - 248 001
   E-mail: base@giasdlol.vsnl.net.in
2. Louis Braille Memorial Research Centre
   Rustom Alapiwalla Complex
   124, Cotton Dept., Cotton Green
   Mumbai - 400 033

Electronic Devices

1. Karishma Enterprises
   132, Maker Tower
   Cuffe Parade
   Mumbai - 400 005
   Ph.: 022-22181853
   E-mail: ke@vsnl.com
2. Telesensory CCTV System
   Manufacturer: Brand Name—ALLADIN,
   520 Almanor Avenue, Sunnyvale
   CA 94085, USA

Appendix 2

Some of the Low Vision Devices Suppliers Around the World

1. Keeler Optical Equipment and Supplies
   (Ophthalmoscopes, handheld instruments and low vision aids)
   Keeler Limited,
   Clewer Hill Road,
   Windson,
   Berkshire SL4 4AA
2. Lighthouse International
   11, East 59th Street
   New York, NY 10022-1202
   Ph.: (800) 8290500
3. The Low Vision Resource Centre
   Hong Kong Society for the Blind
   2/F, Head Quarters Building, East Wing
   248, Nam Cheong Street
   Sahm ShuiPo
   Kowloon, Hong Kong
   Ph.: 00852 2788 8332
   E-mail: drd@hksb.org.hk
4. Centre for Eye Research Australia
   32, Gisborne Street
   East Melbourne 3002
   Victoria, Australia
   Ph.: +61 3 9929 8375
   E-mail: lowvisiononline-info@unimelb.edu.au

5. NAVH
   22 West 21st Street, 6th Floor
   New York 10010
   Ph.: 212/727-2931
   E-mail: staff@navh.org
6. National Association for the Visually Handicapped. It is an agency which provides information, rehabilitation and all resources to visually impaired
   22 West 21st Street, 6th Floor
   New York 10010
   Ph.: (212) 889-3141

Appendix 3

Some Organizations and Their Websites Around the World

This section contains a list of organizations in the field of vision impairment and vision rehabilitation in different parts of the world, and links to each organization's website, where you can find more information.

1. American Association for the Deaf-Blind
   http://www.tr.wou.edu/
2. American Council for the Blind
   http://www.acb.org/
3. American Foundation for the Blind
   http://www.afb.org/
4. American Foundation for Vision Awareness
   http://www.afva.org/
5. Art Education for the Blind, Inc. (AEB)
   http://www.artseducation.info/
6. Association for the Blind and Visually Impaired (ABVI) - Goodwill Industries of Greater Rochester
   http://www.abvi-goodwill.com/
7. The Association for Education and Rehabilitation of Blind and Visually Impaired (AER)
   http://www.aerbvi.org/
8. The Association for Retinopathy of Prematurity and Related Diseases (ROPARD)
   http://www.ropard.org/
9. Blinded Veterans Association (BVA)
   http://www.bva.org/

10. Canadian Council of the Blind
    http://www.ccbnational.net/
11. The Canadian National Institute for the Blind (CNIB)
    http://www.cnib.ca/
12. Central Association for the Blind and Visually Impaired
    http://www.cabvi.org/
13. Community Services for the Blind & Partially-Sighted (CSBPS)
    http://www.csbps.com/
14. Foundation Fighting Blindness
    http://www.blindness.org/
15. Foundation for Blind Children
    http://www.the fbc.org/
16. Hong Kong Society for the Blind
    http://www.hksb.org.hk/
17. International Society for Low Vision Research and Rehabilitation (ISLRR)
    http://www.islrr.org/
18. Jewish Guild for the Blind
    http://www.jgb.org/
19. Lighthouse International
    http://www.lighthouse.org/
20. LV Prasad Eye Institute (LVPEI)
    http://www.lvpei.org/
21. National Association for Albinism and Hypopigmentation
    http://www.albinism.org/
22. National Association for the Visually Handicapped
    http://www.navh.org/
23. National Eye Institute
    http://www.nei.nih.gov/
24. National Federation for the Blind
    http://www.nfb.org/
25. National Library Service for the Blind (NLS)
    http://www.loc.gov/nls/
26. National Vision Rehabilitation Association (NVRA)
    http://www.visionconnection.org/Content/ForProfessionals/Organizations/NVRA/default.htm

27. Research to Prevent Blindness
    http://www.rpbusa.org/
28. Royal Blind Foundation Queensland
    http://www.rbf.org.au/
29. Royal National Institute of the Blind (RNIB)
    http://www.rnib.org.uk/
30. The Royal Society for the Blind of South Australia
    http://www.rsb.org.au/
31. Texas School for the Blind
    http://www.tsbvi.edu/
32. Vision 2020: The Right to Sight
    http://www.v2020.org/
33. Vision Australia Foundation
    http://www.visionaustralia.org.au/
34. Vision/Services for the Blind and Visually Impaired
    http://www.visionsvcb.org/

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