LOW VISION CASE STUDIES

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AIMS

This module aims to outline the impact that low vision has on indivuals via developing an:

- Appreciation of the range of low vision presentations
- Systematic method of vision assessment

LEARNING OUTCOMES

After completing this module, students should be able to:

- Design an appropriate intervention strategy in a range of low vision cases
- Choose the optimum device for improving the level of vision in an individual case of low vision

INTRODUCTION

This chapter includes a review of a variety of low vision cases.

CASE 1

This case involves a 10 year old student with cone dystrophy.

Refractive error:	-3.00D R+L
Best corrected Distance VA:	6/60
Best Corrected Near VA:	3M @ 20cm
Target VA:	1M @ 10cm.

Needs: reading, seeing the board and faces.

NEAR INTERVENTIONS:

Enlargement Ratio (M) = 3/1= 3

$$\text{Equivalent Viewing Distance (EVD)} = \frac{\text{Distance at best corrected}}{\text{Enlargement Ratio}}$$

EVD= 20/3 = 6.67

Power required for Hand and Spectacle Magnifier is the EVP, the inverse of the EVD, so…

Equivalent Viewing Power (EVP)

$$EVP = \frac{100}{EVD}$$

$$EVP = \frac{100}{6.67}$$

EVP = +15D,

- but, the patient is -3.00D in the distance, so the power required in spectacle magnifier is +12.00D
- but, since the child can accommodate well, the power of the magnifier can be reduced, +8 to +10D will be adequate
- the power for the hand-held magnifier remains at +15D, but only available as +16D, so we give +16D (4X).
- but, a stand magnifier will be better for a child when reading, so…

$$EVD = \frac{\text{Eye to Image distance}}{ER} = \frac{\text{Eye to Magnifier + Magnifier to image}}{ER}$$

$$ER = \frac{\text{Eye to Image distance}}{EVD}$$

$$= \frac{10+25}{6.67}$$

25 cm comes from the assumption of 4D vergence from a stand magnifier, where the lens is set under the focal length

10 cm comes from a comfortable near distance for a child working with a stand magnifier

$$= \frac{35}{6.67}$$

= 5.25

= 5x stand mag is required.

In addition, for the stand magnifier to work effectively, he will need a reading stand to maintain a comfortable posture and adequate lighting. The child must receive training in the appropriate use of the magnifier.

DISTANCE INTERVENTIONS:

The patient will also need to be able to see the board in class, so…
Consider a telescope for distance.
Aim, as standard, for a target VA of 6/12
Required M = 60/12 = 5X
From best corrected VA of 6/60, and a target VA of 6/12

Since 5x telescopes are not available, a 4X hand-held Keplerian telescope will be trialled - to use this effectively, he will need to be properly trained.

As using a telescope can be difficult, it is better to start with a lower power. The ideal training telescope (monocular or binocular depending) for a child is a low powered toy telescope readily available from shops. These are inexpensive, about 2X, coloured like a toy, and the child will be able to get used to the concept of a telescope in a playful fashion. It is also suitable for young children.

After the initial training, the introduction of a higher power telescope may be indicated, though usually for slightly older children, e.g. 13-14 year old, and later.

OTHER INTERVENTIONS

The patient has cone dystrophy, so he may require tinted glasses indoors and definitely a darker tint outdoors. A complete filter evaluation showing all filters may be useful, as no filter is perfect for each condition, and testing and demonstration can be helpful.

As the sunshades will only protect our patient from direct sunlight, we also need to prescribe a cap or hat to protect from light coming from above. Wraparound sunglasses or side shields are useful in blocking light coming from the side.

He will also need a felt tip pen for writing

To use all these interventions effectively, the parents and teachers will need to be properly sensitised and the child will need to be motivated and encouraged.

CASE 2

This case involves a 30 y.o. farmer with albinism.

Refractive error:	R +2.00/+3.00X90
	L +3.00/+2.50X90
Best corrected Distance V.A:	6/36
Best Corrected near V.A.:	4M @ 20 cm
Target VA:	1M @ 20 cm.

Needs: grain sorting, intermittent reading, threshing.

NEAR INTERVENTIONS:

Enlargement Ratio (M) = 4/1 =4

EVD = 20/4 =5 cm
As this person has only intermittent needs for grain sorting, intermittent reading and other near tasks, a hand-held (HH) magnifier is the device of choice.

Power of the HH mag (EVP) is inverse of the EVD

EVP = 100/5 = 20D

The hand-held magnifier can be used with his distance correction.

DISTANCE INTERVENTIONS:

Telescope for distance: Aim for a target VA of 6/12
Required M = 36/12 = 3X, a Galilean hand-held telescope can be used

OTHER INTERVENTIONS:

- Photochromic tint for distance Rx
- Peak cap or hat
- Sun block or covered clothing

Minimal training will be required, but instructions in the proper use of the devices must be given.

CASE 3

This case involves a 65 y.o. woman with diabetic retinopathy and early cataract.

Refractive Error:	+3.00D R + L
Best corrected Distance VA:	6/30 = 0.7 LogMar, Left eye is better
Best Corrected Near VA:	2M at 20cm with +3.00D add.
Target VA:	0.8M will be adequate for her needs

Needs: Can't see faces, difficulty with mobility, difficulty in the kitchen, wants to read the bible and sew.

NEAR INTERVENTIONS:

Enlargement ratio (M) = 2/0.8 = 2.5X
EVD = 20/2.5 = 8cm
EVP = 100/8 = 12.5D

Spectacle Magnifier in a half eye is the best solution, so she can keep her hands free for working and sewing and still use her limited distance acuity (not blurred through her spectacle magnifier).
She will not benefit from a hand magnifier, as her hands are be too shaky to use it effectively. She will also need a large print bible.

Magnifier power = required magnifier power + required distance spectacle correction
= +12.5D + +3D
Prescribe half eye (look over) single vision near glasses of:
Right Eye: Frost
Left Eye: +15.50D

DISTANCE INTERVENTIONS:

The patient will have difficulties using a telescope, so we will forgo it for more practical non-optical interventions.

OTHER INTERVENTIONS:

Her needs also extend to kitchen duties, so…

- Advice on colour/contrast e.g.
- Cutting board (Black and White)
- Bright handled knife
- Jars clearly marked with large signage
    - Dark colour jars for salt/flour/rice
    - Light coloured for tea/coffee/spices
- Stove knobs/handles of cooking pot marked with high contrast
- Dark table cloth for eating with light coloured plates, etc.

Her needs also extend to grooming and self-care, so…

- Dark coloured soap tray, magnifying mirror.

Her needs also extend to mobility, so…

- Well-arranged furniture, so there are clear passages, and things remain in their designated location.

Advise on the three B's

- Bigger, Bolder, Brighter, thus making the environment more accessible
- Steps and edges should be brightly marked with contrasting colours
- Use of a walking stick, not a white cane
- Pill box or well-labeled jars for medication (diabetic pills, blood pressure pills, etc.).

No telescope or other optical devices will be prescribed, as they will not really help this client.

CASE 4

This case involves an 18 y.o. student at The School for the Blind.

Complaints: Difficulty with distance vision, spectacles are not good.

Needs: improved near vision, wants to cook, would like to work and wants training in low vision devices at this time.

Problems started at 4 years of age.
Previous examination: Spectacles and telescope prescribed.
Had difficulties using the telescope at the time it was prescribed.
Lifestyle - parents don't allow her to do a lot of things e.g. ironing, going out.

Distance Rx:	-9.00/-1.00 X 90 R and L	
Distance VA:	R 1.48 ($6/190^{+1}$)	
	L 1.04 ($6/60^{-2}$)	
Near VA:	R 3.2 M @ 8 cm	
	L 1M @ 8 cm	
Contrast Sensitivity Function:	Binocular	5 @ 1m
		15 @ 15 cm
		25 @ 25cm, indicating reduced contrast, though should be done monocularly.
Visual Field:	Constricted	
Colour Vision:	Abnormal	
Other Observations:	Light sensitive and increase nystagmus on exposure to light.	
New Rx:	-8.50/-1.00X90	
	-8.00/-1.00X90	
New DVA:	R 1.4 (6/150)	
	L 1.16 = $6/95^{+2}$, n.b. better with old prescription	

DISTANCE INTERVENTIONS:

Telescope required for distance.

Power calculation:	Distance acuity:	6/95
	Target Acuity:	6/12

Telescope required is 95/12 = 8X, but this is not available and too difficult to start with (although 6X is also probably too difficult as a starting point for a new user), however…
A telescope of 6X was trialled, giving…

Distance VA: 0.48 ($6/19^{+1}$)

The 6X telescope, while not giving the desired blackboard reading of 0.3 (6/12), will be a great help to the client for her stated goal of employment, as improving her distance acuity may make her more employable.

As the client has requested training in the use of the telescope, extra time and care must be taken during the course of telescope training, and her progress should be reviewed at two-weekly intervals for two months.

We also believe that with the telescope, she will be more independent, and improve on her ability to carry out tasks in her home.

As there is no improvement with the new distance spectacle correction, her old prescription should be maintained.

NEAR INTERVENTIONS:

It is not expected that a patient who can read 1M on the near chart would complain of reading difficulties in class. This is most likely due to her poor contrast sensitivity and a relative lack of contrast found on some reading materials.

In this case, although she should be able to read up close without her spectacles, a hand-held magnifier is indicated for use in class, primarily so that her distance spectacles do not need to be put on and removed regularly shifting between looking at the black board and reading. When the client is reading for extended periods however, the spectacles should be removed.

We could also consider prescribing her something like a +2.50D addition over her distance glasses, to increase her working distance at near for gross tasks. She would wear those glasses when doing desired intermediate tasks like cooking.

OTHER INTERVENTIONS:

As her stated goal is to be able to do more things in the home and be more independent, we must advise on non-optical improvements of mobility, self-grooming, kitchen duties, etc.

CASE 5

This case involves a 15 y.o. male with bilateral aphakia.

Goal: wants to become a teacher, play football, work around the house

Needs: read story books, Quran and see black board.

Previous prescription: Spectacles and telescopes previously prescribed, though not helpful and not used.

Other Information: Problem was there since birth.
Surgery 3 years ago
Parents give him support

DVA: R 1.2 (6/95)
L 1.5 (6/190)
O.U. 1.3 (6/75)

NVA: R 4M @ 12cm
L 6.3 M @ 11cm

Contrast Sensitivity Function:

R 5 @ 25 cm
12 @ 10 cm

L 5 @ 18cm
10 @ 10cm

Visual Field:		75				65	
	75		45		65		65
		65				95	

Colour Vision: D15 normal
Refraction: +12.00 DS R and L
Distance VA : R 1.2 (6/95)
L 1.5 (6/190)
Near VA: 2M @ 15cm

DISTANCE INTERVENTIONS:

There is no quantifiable improvement on the VA chart with the +12.00D spectacles, but the client says that he does see better with the glasses on. He has not seen clearly for some time, and the brain may take time to recognise 'clearer' images again, though he will undoubtedly be amblyopic. Distance glasses will be prescribed for full time wear.

For a telescope:
Distance Acuity: R 1.2 = 6/95
Target Acuity: R 0.3 = 6/12

M = 95/12 = 8X, but is not available and not appropriate for a first time user, although a 6X is also a little strong, there have little other option, so…

Try a 6X telescope which provides a VA of 0.4 (6/15). While it does not reach the target VA, it will improve the client's ability to see faces, signage, etc.

NEAR INTERVENTIONS:

The spectacles have already improved his ability to read from 4M to 2M, but if he wants to read normal print, he will need to get to 0.80M.

Near VA 2M @ 15cm
Target VA 0.80M @ 10cm

M = 2/0.80= 2.5X

EVD = 15/2.5= 6cm
EVP = 100/6 = 16.67D (approx. 16.50D)

Spectacle correction = 16.50D + 12 D = 28.50D

Hand-held magnifier is +28.50D, used with distance correction.
Our client sees 0.80M with both the distance spectacles and hand-held magnifier.

Stand Magnifier

$$ER = \frac{10+25}{6}$$

25 cm comes from the assumption of 4D vergence from a stand magnifier, where the lens is set under the focal length
10 cm comes from a comfortable near distance for a person working with a stand magnifier

= 5.8
= 6X

As the client will be using a stand magnifier and is aphakic, in theory he needs the near correction in the spectacles. We would normally use a +3.00D add, meaning that he would require his distance correction (+12.00) plus a near add (+3.00) = +15.00D.
However, it is more likely that he is going to have one pair of distance spectacles (+12D) and cope with the reduced acuity. This can be overcome in this case by wearing the spectacles slightly down the nose for reading.

CASE 6

This case involves a 16 y.o. female who attends The School for the Blind.

History: Congenital Cataract. Bilateral cataract surgery with IOL implant 3 years ago. She was scheduled to visit her ophthalmologist every two weeks but had not done so in the last year. There has not been any low vision assessment besides a refractive evaluation after her surgery.

Goal: To read print, attend regular school and further education to then choose a suitable career.

Lifestyle: Performs normal household chores including cleaning, cooking, washing, fetching water, etc.

Social History: The child is one of a family of 10 – both parents and 8 siblings. She has good family support.
As the right eye was LP (light perception) only, no testing was carried out on that eye.

Distance VA:	R: LP	L: 1.7 (6/300)
Near VA:	R < 8M	L: 3.2M @ 5cm
CSF:	L: 1 @ 15cm, 3 @ 10cm	
VF:	L:	20 20 20 45
Colour vision (Coloured Pencils):	4/4	

Refraction

Objective	- 14.00D	VA	1.6
Subjective	- 14.00D	VA	1.6

DISTANCE INTERVENTIONS:

Telescope:

VA	=	1.6	=	6/240
TARGET VA	=	0.3	=	6/12

TELESCOPE REQUIRED = 240/12
= 20X

This telescope is not available, so try a 6X instead.
This gives us a VA of 0.9. This provides an acuity of 6/48. An improvement from 6/240 to 6/48 is marked, and will help the client in the areas of sighting faces and some other viewing tasks in the home.
Distance spectacles should be prescribed for full time wear, although at a slightly reduced power, probably -10D R and L, even though there is no quantifiable improvement in VA. See case #5.

NEAR INTERVENTIONS:

Stand magnifier

Best corrected VA	=	3.2M @ 5cm		
Target VA			=	1M @ 10cm

Enlargement ratio	=	3.2/1	=	3.2X
EVD	=	5/3.2	=	1.6
EVP	=	100/1.6	=	62.00D

ER = 25 + 10/ 1.6 =35/1.6
= 22x, this is neither practical nor available, so trial a 12X magnifier, which provides a VA of 1.25M @ 3cm.
This will enable her to read, and it will prescribed. As the field of view of a 12X magnifier is very small, it is only suitable for spot reading.

<u>Spectacle magnifier and Hand Magnifier</u>
EVP = 100/1.6
= +62.00D.
For a hand magnifier, this is too strong to be practical.
For the spectacle magnifier, consider the myopia of -14.00D and reduce the power by 14.00D to (62-14) = +48D. This is still too strong to be a practical spectacle magnifier.

Advice:

1. Because the distance vision remains relatively poor, we advise our client to continue with learning Braille, in conjunction with spot reading at near with the stand magnifier.
2. A CCTV would be a great help for near tasks.