Clinical Techniques for Prescribing Bioptic Telescope Devices

Henry A. Greene, O.D., F.A.A.O.
Clinical Professor, Department of Ophthalmology
University of North Carolina at Chapel Hill
Vice President, Ocutech, Inc.
Course Description

• Practical, clinical approach to evaluating visually impaired individuals for bioptic telescopes
  – Clinical protocol
    • assessment of an individual’s visual needs
    • determining appropriate patients
    • establishing a prognosis for likely prescription success
  – Methods for fitting and training patients
  – Practice management tips
Challenges of Low Vision Care

• Major optical goal is to magnify the image sufficiently to make it discernable by the patient

• Magnification
  – minimizes the field of view,
  – distorts the image,
  – shortens the working distance,
  – and constrains the depth of field

• All of these work to undermine fluency and increase fatigue.
The activity distance determines the type of management

• Optical magnification requires that the material to be viewed be held at the focal length of the optical system
  – Usually much closer than the habitual working distance of the user

• However, some activities must be performed at distances defined by the activity
  – Cooking, reading music, TV, computers, traffic signals
The activity distance determines the type of management

- The optical device must provide a working distance supportive of the activity
  - magnify the image enough to be able to resolve it
  - telescopic aids
    - focusable or
    - fixed-focus using reading caps
- Move closer
- Bring it closer optically
  - Telescopic aids
Reading is a solitary activity

• Usually the first activity that the patient hopes to improve
• Reading is usually done at home or in isolated situations
• Easiest to support
  – print is high contrast
  – lighting can be controlled
  – devices prescribed are often familiar to most individuals
• Reading is also the most easily replaced through other option
  – radio, books on tape,
  – sighted readers, reading machines
Distance vision is a social activity

• A public activity
  – impacts social interaction
  – hence quality of life.
• Loss of ability to see body language and make eye contact
  – isolating
  – contributes to depression
• Impacts independence and self-worth
• Cannot readily be replaced through other modalities
Refraction
First option to improve distance vision

• First and most convenient option
  – usually a two-line improvement is required for the patient to experience a functional gain

• Brief retinoscopy through the current eyeglasses
  – see how close to neutral the reflex is as well as its quality
  – If the reflex is dull due to media issues, consider therapeutic options that might improve it.
  – No amount of lens power will impact acuity if there are significant media opacities
  – If the patient is post cataract surgery with IOLs, it is unlikely that they will have a significant refractive error

• Trial Frame
Refraction

• Make a sufficient enough power change for the patient to notice (JND)
  – If they can’t notice a half-diopter change, then try one or even two-diopter changes

• High-contrast acuity chart is a poor determiner of functional value
  – Low contrast target such as someone’s face at the furthest distance that they can normally see it
  – If the patient can notice a difference, then it’s likely to be of functional value

• Acuity will fluctuate as fixation varies
  – You won’t get big changes in acuity from small changes in power
Ways to further enhance distance vision

• When refraction is the best you can achieve and acuity remains inadequate for the patient’s goals, than there’s only one option left to further enhance distance vision- make it bigger!

• We have only two ways to do that—
  – walk up close enough to see it
  – bring it closer optically
Low Vision Telescope Optics “101”

- Optical telescopes are available in two designs—
  - Galilean
  - Keplerian

- Each has its distinct characteristics and attributes.
Galilean telescopes

- Small and lightweight
- Simple optical design
- Bright image
- Narrow fields of view
  - (about 5 degrees at 3x)
- Tend not to be sharp edge-to-edge
- Fixed-focus
- Focusable
- 1.7x, 2.2x and 3x powers, but are available as high as 6x.
- Convenient for binocular prescriptions
Keplerian telescopes

- Longer
- Heavier
  - Incorporate prisms to reorient what would otherwise be an upside down and inverted image.
- Fields of view at least twice as large as Galilean telescopes
  - (about 12 degrees at 4x)
- Dimmer and have reduced contrast
- Larger objective lenses produce brighter images
- All commercially available Keplerian telescopes are focusable
  - One autofocus device
- Most frequently prescribed in 3x, 4x and 6x powers, though other powers are also available.
The prescriptive goal

- What are we trying to achieve when we prescribe a telescopic device?
- 20/40?
- >5 degree Field of View?
The patient’s perspective on telescopes

- Everything appears closer
- The value to the patient is that they can see it further away
- A 4x TS will allow a target normally only visible as far as 10 feet away to now be seen as far as 40 feet away
- Not all patients receive a geometric acuity gain from telescopes
Telescopic Options for Low Vision

• Handheld
  – Galilean and Keplerian: 2x to 8x+
  – Magnification greater than 6 or 7x, then handheld monoculars (or even binoculars) become the only compelling option
  – If the telescope would be used only rarely and for episodic activities often a handheld version would be acceptable

• Spectacle clip-on
• Head born self-contained
Head Born Telescopic Options

• Hands are unavailable
• Lack of dexterity
• Extended viewing purposes
• Spectacle mounted designs
  – Full diameter
    • telescope centered in the frame
  – Bioptic
    • positioned above the line of sight so that the user can alternate their view between the carrier lens and the telescope
Telescope Prescribing Protocol

- The Telescope Prescribing Protocol is divided into two parts:
  - **Hard Signs**, those that can be measured or otherwise determined
  - **Soft Signs**, those that are judgments and are developed through patient interaction
Hard Signs

• Visual Acuity:
  – Best corrected visual acuity through conventional lenses is in the 20/70 to 20/300 range

Goal:
  – The patient should be able to read fluently to at least the 20/50 line while looking through the telescope.
    • 20/40 for more demanding activities
    • 20/30 for very demanding activities
Hard Signs

• Contrast sensitivity:
  – Able to see facial features while looking through the telescope at a distance of 12 feet under normal room illumination

Goal:
  – They should see the face much better through the telescope

Negative responses:
  – If they report that the face is larger but NOT easier to see than the prognosis for telescope success is reduced.
  – Consider Galilean devices rather than Keplerian, or handheld Keplerian monoculars with large objective lenses.
• Ocular Dominance:
  – The better seeing eye is the dominant eye, OR, that while looking through the telescope the dominant eye sees better than the fellow eye

**Goal:**
  – The better seeing eye is the dominant eye.

**Negative response:**
  – If the better seeing eye is not dominant (there is a “dominancy conflict”), it is often desirable to prescribe a binocular system. Another approach, though less successful, is to occlude the dominant eye while the patient is sighting through the bioptic.
Soft Signs

• **Appropriate activity goals for use of the device**
  – Midrange and beyond activities
  – Have patient tell you what they’d use it for

• **Goal:** The patient has mid-range and beyond visual activity goals.
Soft Signs

• Dexterity with the device

• **Goal:** The patient responds to the device favorably, can find targets while looking through the device, and improves with practice during the evaluation.
Soft Signs

• **Motivation and enthusiasm**

• **Goal:** The patient is excited about how they are seeing with the telescope and embrace the opportunity to improve their vision.
Summary

• In the final determination of an appropriate bioptic prescription, a combination of the hard and soft signs will create an overall prescribing prognosis for the individual patient.

• This systematic approach can be helpful in advising the patient of the likelihood of their successful adaptation to the telescope system.
Rating Suggestion

• Assign a value of 2 points to each of the 6 clinical signs, and assign a rating scale in \( \frac{1}{2} \) point increments.

• A score of 9 or above offers a favorable prognosis.

• Six or below suggests a poor prognosis.
<table>
<thead>
<tr>
<th>Factor</th>
<th>Poor</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA 20/70 to 20/300 with conventional Rx</td>
<td>0.5</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>20/50 or better with TS</td>
</tr>
<tr>
<td>Contrast Sensitivity (facial features at 12ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See face much better with TS</td>
</tr>
<tr>
<td>Ocular Dominance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Better seeing eye is dominant</td>
</tr>
<tr>
<td>Appropriate activity goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mid-range and beyond goals</td>
</tr>
<tr>
<td>Dexterity with device</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Improves with practice during evaluation</td>
</tr>
<tr>
<td>Motivation &amp; Enthusiasm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excited about how they see with bioptic</td>
</tr>
</tbody>
</table>
Bioptic telescope fitting steps

- Determine the eye that will use the TS
- Align with that eye
- Adjust the bridge so that the bottom of the eyepiece aligns with the top of the pupil
- Adjust the telescope angle of inclination to site straight through the eyepiece when the head is tilted down
- Set the focus
Patient management protocol

• Instruct the individual regarding the impact and value of the device

• Explain the factors that contribute to establishing their likelihood of success
Patient management protocol

• Indoctrinate the patient
  – Explain the impact of low vision on lifestyle
  – Explain characteristics of low vision telescopes
    • Narrow field of view
    • Shallow depth of field
    • Need to focus
    • Need to keep head still

• Evaluate the patient and demonstrate telescopes
  – Show handheld devices first- demonstrate DOF, FOV, and focusing
  – Show spectacle-mounted systems next
  – Provide realistic experiences
    • out of the exam room- show packages on shelves, faces, pictures, TV, flowers, signs, etc.
Patient management protocol

• Qualify the patient
  – Explain hard signs- VA, contrast, dominancy
  – Explain soft signs- goals, dexterity, and response

• Recruit the patient
  – Establish a prognosis- based upon hard and soft signs
  – Discuss the challenges and need for training and practice
Clinical Issues for Prescribing Bioptic Telescopes

• Carrier lenses
  – Order the eyeglass prescription the patient normally wears for distance vision.
  – Prescribe a bifocal if that is what the patient usually wears.
  – We normally use flat-top and round segment designs
    • avoid trifocals and progressives.
Clinical Issues for Prescribing Bioptic Telescopes

- Maintain at least 10mm between the top of the bifocal and the bottom of the eyepiece.

- Eyepiece Corrections:
  - Varies upon the brand of telescope
    - Designs for Vision:
      - all prescriptions
    - Ocutech:
      - sphere power above +/- 12D, or cylinder above 3D
Clinical Issues for Prescribing Bioptic Telescopes

• Illumination Control
  – Slip-behind sun filters are available in a selection of colors
  – Filter caps and internal filters can also be ordered
  – Fitovers (NOIR, etc.)
When should I consider prescribing autofocus?

• Visual activities from 15 feet and closer
• When visual attention will be frequently alternated from near to distance
  – such as from the desk to the blackboard
• When extended near-point activities are required
  – such as playing cards, musical instruments, or using the computer.
Why not consider electronic vision displays?

• Technical challenges have not yet caught up with the dream

• Issues
  – Field of view
  – Stabilization of images
  – Contrast and contour
  – Display brightness
  – Mobility
Telescope Training Techniques

• Give the patient a tour of the device
  Carrier lenses, Telescope eyepiece, Focus knob

• Focusing
  • At distance- take advantage of depth of field
    – Place the focus
  • At near- preset, hand focus, and head focus
Telescope Training Techniques

- **Translation** (switching fixation between the carrier lens and telescope eyepiece)
  - Look first through the regular eyeglass lens (carrier lens) of the bioptic which provides your customary distance vision.
  - Look directly at the object you want to magnify.
  - Drop your head slightly and look up into the eyepiece.
  - You should see a full, round magnified image.
  - You may have to focus it to get the image clear.
  - Practice switching between the carrier lens and the telescope until you can do it easily and without losing your target.
Telescope Training Techniques

Localization at near

- Near objects can be more challenging to find due both to the narrow field of view and the visual mismatch.
- First find the object in the telescope field of view,
  - while looking at it, pass your upraised finger across the field of view several inches in front of the target.
  - Once you can see both your finger and the target at the same time, watch your finger as it moves in to touch the target.
- You MUST watch your finger while looking through the telescope to learn to do this.
- A convenient technique:
  - Try to touch the buttons on a telephone keypad.
  - Disconnect the phone first!
Telescope Training Techniques

• Have the patient put it on, take it off, and put the bioptic away themselves
  – Place level on the face
  – Temples flat across the ears
• Discuss proper care and cleaning
• The eyepiece is apt to get soiled and filmy
  – Clean with an approved microfiber cloth
• The device should never be placed under a faucet!
Trouble shooting bioptic systems

The patient does not see a full field

– Check to see that the telescope is properly aligned and inclined for the patient
– Review the eyepiece position fitting method
– Adjust the bridge and temples to reposition the aid for the proper line of sight
Trouble shooting bioptic systems

The image is not clear

- Check to see that the telescope is properly focused
- The eyepiece and front lenses are clean
- There is not significant refractive error that might preclude clear vision through the telescope.
- Check that the patient is using the appropriate eye to sight through the telescope
- Make sure there isn’t a dominancy conflict that undermines the functionality of the device
Trouble shooting bioptic systems

The patient complains that the field of view is small
• Check to see if shortening the vertex distance is possible by adjusting the bridge
• Also explain that all telescopes have a narrow field of view, but that patients usually will adapt over time

The patient complains that they have to drop their head too much to see through the telescope
• Check to see that the frame is as low as possible on the bridge
• Check that the angle of inclination of the telescope is as low as possible
Trouble shooting bioptic systems

The patient sees two images:

• **Monocularly**: If the diplopia occurs when only the eye using the telescope is open, readjust the telescope position to eliminate the second image

• **Binocularly**: If the diplopia occurs only when both eyes are open, consider:
  – The patient is unable to suppress the eye not using the telescope.
  – The non-dominant eye was prescribed the telescope
  – One option is a sector occluder across the top of the carrier lens for the non-telescope eye
  – Another option is to prescribe a binocular system
Trouble shooting bioptic systems

The image through the telescope is too dim.

• Recheck the eyepiece position
  – Slight misalignment can significantly decrease image brightness
  – Shine a penlight into the front of the TS to determine the eyepiece position on the pupil

• If this is still not adequate, check that the front and back lenses are clean and free of grease and oil

• Check also that the internal optics are not fogged by holding the telescope to a light and looking through it backwards (through the objective lens)
**Dr. Greene’s Pearls**

- If the patient has reasonably good acuity (20/80 or better), I’m considering 2.2x and 3x Galilean, or 2.75x and 3.0x Keplerian devices (if field of view is a concern)

- If acuity is similar between the eyes or if I’m concerned about dominancy issues, I’ll consider the same powers in a binocular design

- If contrast is an issue, I’m thinking about Galilean designs first

- If acuity is between 20/100 and 20/300 I’m thinking 4x and 6x Keplerian designs, especially if there will be near point applications and I want them to be able to focus

- If acuity is worse than 20/400, I’m thinking 8x and higher handheld monoculars or hi-power (7x) head born devices