NEW SPECTACLE TELESCOPIC DESIGN HOLDS PROMISE FOR LOW VISION PATIENTS

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Background: Many innovations in the field of low vision rehabilitation have provided patients with optical aids that meet their need for independence**.** Patents with central vision pathology however, still have great difficulty adapting to spectacle telescopic lens systems because they cannot find the exit pupil and keep it aligned. They are confused, worried and frustrated and often ask "Doctor; can you just make me a pair of glasses that I can see through". They are healthier and living longer, better educated and more savvy. In essence, they want to maintain an independent lifestyle and they want what they want and they want it now.

Methods: Ninety-Four (94) patients from seven national and two international sites were evaluated in this study. Patients were chosen at random from the clinical populations of the nine site locations and were required to meet a distant visual acuity level, with spectacle Rx, equal to or better than 20/200 in one or both eyes to be included. A single subject analysis was utilized.

Results: Eighty percent of the patients tested were not using a spectacle telescope. Of those who reported using a telescope, thirty-eight percent were using a Designs for Vision system while the rest of the twenty percent were divided between Eschenbach, Walters, Ocutech and miscellaneous other systems. Sixty-five percent responded positively to the Politzer Telescopic Lens (PTS) series design and most preferred the 1.7X rectangle or round/22 designs. Patients could see better and reported a subjective improvement of sixty-eight percent and a corresponding 3.62 lines of improved visual acuity. The cosmesis was not an issue and fifty-two percent indicated they would purchase a system if given the opportunity to do so.

Conclusions: The results indicate that the PTS design series meets the requirements established in this study. The new design series has created a new set of spectacle telescopes that are easier and more effective for the patient to use. Despite traditional optical design concepts, enlarging the exit pupil does impact ease of use, field size and image brightness.

Key Words: Low vision, vision rehabilitation, optical aids, central vision pathology, exit pupil, independence, spectacle telescopes, Politzer Telescopic Lens Series, visual field, image brightness.

Many innovations in the field of low vision rehabilitation have provided patients with optical aids that meet their need for independence. These low vision aids fall into various categories that meet activities of daily living requirements such as mobility, reading, interacting with other people or self care skills.

Low vision patients are expressing their need for more independence. They are healthier and living longer. They are better educated and more savvy and want to be able to drive, access the Internet, recognize objects and people's faces in various social settings, read, play cards and pay their bills. In essence, they want to maintain an independent lifestyle and they want what they want and they want it now. However, what they want is currently not available.

Patients are confused, worried and frustrated and often ask "Doctor; can you just make me a pair of glasses that I can see through". They realize that their eyes are changing, that they are possibly getting worse and have a desire to "go back to the way it used to be". The reality is that just a "pair of glasses" will not meet all of their needs.

Patients with central vision pathology have difficulty adapting to and using currently available spectacle telescopic designs. It is more difficult for them to find the exit pupil and keep it aligned while using the telescope or telemicroscope.

Telescopes and telemicroscopes that are currently available characteristically have small exit pupils because they are designed for the static eye. With a large objective lens and small ocular lens the field of view is reduced. Patients report that static eye systems, which use a frosted housing unit, tend to increase internal light scatter and create glare. The systems that use a black housing unit reduce internal light scatter with glare and enhance image quality. However, this type of housing causes objects being viewed to appear darker and are cosmetically objectionable.

The size of the exit pupil traditionally has been limited by the size of the objective lens and the magnification of the telescope. The diameter of the exit pupil is determined by dividing the diameter of the objective lens by the magnification of the telescope.

Eg. A 2.0X telescope with a 40mm objective lens would then have an eye piece lens and exit pupil diameter of 20mm.

The field of view of a telescope is limited by the diameter of the objective lens at a given magnification. The exit pupil diameter is inversely proportional to the magnification and

the image brightness of the telescope is determined by the size of the exit pupil relative to the size of eye pupil. Fixed eye designs show that enlarging the exit pupil beyond the size of the eyes entrance pupil will have no effect on increasing the telescopes field of view or its image brightness.

However, according to Marvin Hutt, Ph.D., Senior Adjunct Associate Professor of Optical Engineering at the Stevens Institute of Technology, New Jersey

“Design of low powered telescopes to maximize the ease of use regarding less long term strain on the eye requires that the eye swim in an enlarged device exit pupil”.

“While the classical optical design calls for a static eye pupil with an iris diameter set by ambient lighting, the philosophical impact of the device exit pupil being close to the iris diameter of the eye is a tunnel appearance of the field. This leads to long term eyestrain and a physiological reduction in the apparent view through the system”.

“In wearing these devices the patient will almost invariably prefer the system where the eye swims in an enlarged exit pupil even though from a non-moving eye model, the over sized device exit pupil is not necessary.”

Methods

The challenge, therefore, was to find a spectacle telescope that would meet the following requirements and conditions so that patient use and acceptance would increase:

1. Easy exit pupil accessibility
2. Brighter image quality
3. Larger field of view
4. Less distortion for a more natural appearance of objects viewed
5. Cosmetically appealing

Experimentation with various optical designs led to a modification of the Designs for Vision 1.7X full diameter telescope.

By making the objective and eye piece lenses the same diameter, a larger exit pupil was achieved; 11 to 40% increase depending upon system and power (see diagrams 1 & 2 and table 1**)**. Improved light gathering and glare reduction were achieved with a light beige housing.

The Politzer Telescopic Series (PTS) design was manufactured by Designs for Vision and a study, utilizing clinical patient populations from nine (9) domestic and international

sites was begun. The purpose of the study was to determine patient objective and subjective responses to the PTS design series.

Ninety-Four (94) patients were evaluated. Patients were chosen at random from the clinical populations of the nine site locations and were required to meet a distant visual acuity level, with spectacle Rx, equal to or better than 20/200 (as measured with the Feinbloom test chart at ten feet) in one or both eyes to be included. A single subject analysis was utilized.

Ocular pathologies included:

- Optic Nerve Atrophy 5
- Diabetes 12
- Chorioretinopathy 6
- Macular Degeneration 60
- Glaucoma 5
- Albinism/Nystagmus 6

The PTS design series to be tested included the following:

1.7X Full field rectangular (see figure 1)

1.7X Full field 22mm round with +3.00 prism reading caps (see figure 2)

1.7X Bioptic I (see figure 3)

2.2X Bioptic I (see figure 4)

The clinical data were recorded on the PTS series research recording form (see appendix 1)

The testing protocol consisted of:

A. Measure and record best corrected binocular distance and near visual acuity with the patients habitual Rx using the distant and near Feinbloom visual acuity testing charts. The testing distance was set at ten (10) feet for distance, habitual reading distance for near measured in M notation and full room illumination was utilized.
B. Measure and record binocular distant visual acuity with no spectacle Rx for each of the (PTS) telescopes listed above.
C. Measure and record binocular distant visual acuity with spectacle Rx for each of the (PTS) telescopes listed above. A plastic lens flipper containing the patients spherical equivalent lens prescription was placed behind the eye piece lens of the telescope when testing visual acuity using spectacle Rx.

D. Measure and record binocular near visual acuity with no spectacle Rx for the 1.7X full field 22mm round telescope with the +3.00 prism reading caps.
E. Measure and record binocular near visual acuity with spectacle Rx for the 1.7X full field 22mm round telescope with the +3.00 prism reading caps.
F. Patients were asked the following questions:

1. Are you currently using a spectacle telescopic lens system? Yes or No
2. If yes, which one?
3. If yes, do you prefer your telescope or one of the (PTS)?
4. If the (PTS), which design?
5. If you are currently not using a telescopic system, do you see better with your glasses or one of the (PTS)?
6. If the (PTS), which design?
7. How much improvement with your preferred (PTS) do you notice as a %?
8. Is the weight, size and appearance of your preferred (PTS) agreeable or disagreeable to you?
9. How does the (PTS) help you?
10. Would you purchase your preferred (PTS)?

Results

Eighty percent of the patients responded that they are currently not using any kind of spectacle telescopic system. Twenty percent responded that they were using a telescopic system. Of the twenty percent, thirty-eight percent were using a Designs for Vision product, twenty-two percent Eschenbach, twenty percent Ocutech, fifteen percent Walters and the remaining five percent others.

Sixty-five percent of the patients responded that they preferred the PTS to their own telescopic system. Thirty percent responded that they preferred their own system and five percent saw no difference. Of the sixty-five percent that preferred the PTS, forty-two percent preferred the rectangular full field design, thirty-eight percent the round 22mm design and twenty percent were evenly split between the 1.7X and 2.2X Bio I designs.

When comparing visual clarity between the patients Rx and the PTS, sixty percent responded that they saw better with the PTS, thirty percent saw better with their Rx and ten percent saw no difference. The subjective amount of improvement of the sixty percent, based on a scale of 100, was 68 percent. Objective measurements of visual acuity revealed an improvement of 3.62 lines using the Feinbloom distance chart at ten feet.

When questioned about the cosmesis of the PTS design, sixty percent responded that they found the systems cosmetically agreeable, thirty-five percent responded that they found the design disagreeable and five percent were undecided.

When asked how the PTS series helps you, the most common responses were “my vision is sharper and clearer”, “it is easy to use”, “objects are bigger, brighter and have more detail” and “I can read and see small print”.

Finally, on the question of would you purchase a PTS, fifty-two percent responded that they would purchase a system, ten percent maybe and thirty-eight percent responded that they would not purchase a system.

Discussion

The clinical process of prescribing and fitting the PTS is relatively easy. As with any low vision aid examination, begin by determining the best possible spectacle correction. Trial frame the various PTS systems with and without the spectacle correction to determine which combination subjectively gives the patient the best distant vision. Then demonstrate the system chosen by having the patient look out a window or go outside while wearing a demonstrator system of the same design and magnification power. Repeat this process utilizing reading caps to determine the best vision for intermediate and near viewing distances.

Potential uses of the PTS include:

- Watching TV
- Seeing Faces
- Sitting on the porch and watching traffic
- Watching outdoor activities
- Using the computer
- Playing cards
- Finding objects on the shelf
- Setting the dials on the stove, washer or thermostat
- Seeing the controls on the microwave
- Seeing the preacher at church
- Seeing grandchildren play

Conclusions

The results indicate that the PTS design series meets the requirements established in this study. The new design series has created a new set of spectacle telescopes that are easier and more effective for the patient to use.

Despite traditional optical design concepts, enlarging the exit pupil does impact ease of use, field size and image brightness. Objective comparative measurement of the visual field size between the Designs for Vision standard 2.2X Bioptic I and the PTS 2.2X Bioptic I indicate a twelve percent increase in the horizontal visual field of the PTS over the standard model (see diagram 3).

Additionally, with a larger exit pupil the fitting is easy and very little training is required to teach the patient how to view through the telescopic system

Patients appreciate being able to experience the effectiveness of a “real” system. This process helps them to understand what their system will look like and how it will work in the real world.

Metal frames with a frame pupillary distance (PD) equal or close to the patients PD are recommended. Adjustable pads allow for the lens system to be properly aligned vertically and horizontally and placed close to the patient’s eyes (8-10mm vertex distance) for enhanced ease of use. And, the PTS design series has now been expanded to include 2.2, 3.3 and 4.0X bioptic micro-spiral models with plus lens, prism and split field caps available for all full field and bioptic model one designs.

The PTS design series is fast becoming an integral part of low vision practice. Patients are using the PTS and enjoying it. They continue to find new and innovative uses for this aid and do not object to the issues of size, weight or appearance. The major issue of cost has been resolved with the use of flexible funding sources that provide interest-free financing to qualified patients.

Should you have any questions or request additional information you may contact the author directly or Designs for Vision, Inc.

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DIAGRAM 1

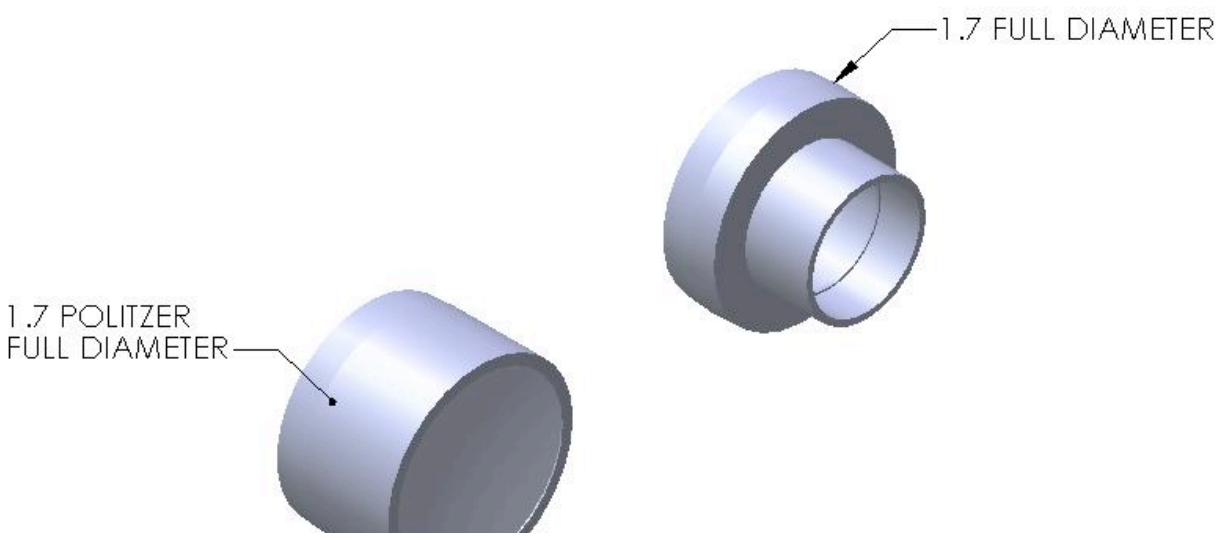
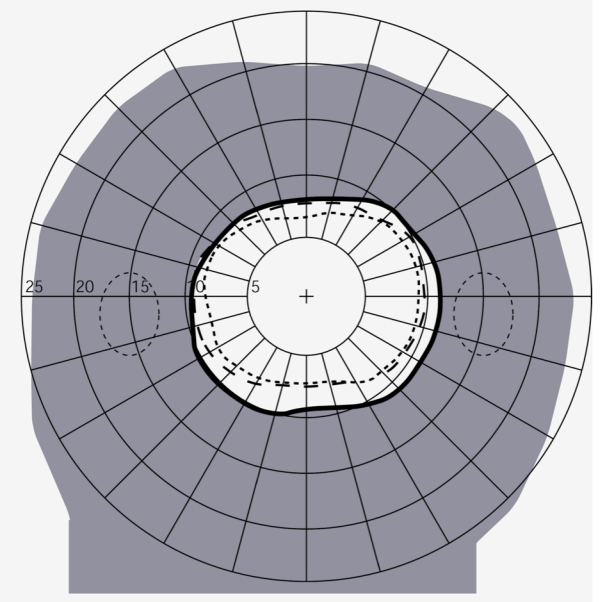


TABLE 1

TELESCOPE	EXIT PUPIL SIZE	SIZE DIFF mm	% INCREASE
1.7X FDTS	19mm Round		
1.7XPTS(RECT)	13(H) X 21(W)	2	2/19 = 11%
1.7X Bio I	11mm Round		
1.7X PTS(BioI)	11(H) X 13(W)	2	2/11 = 13%
2.2X Bio I	10mm Round		
2.2X PTS(BioI)	10(H) X 14(W)	4	4/10 = 40%

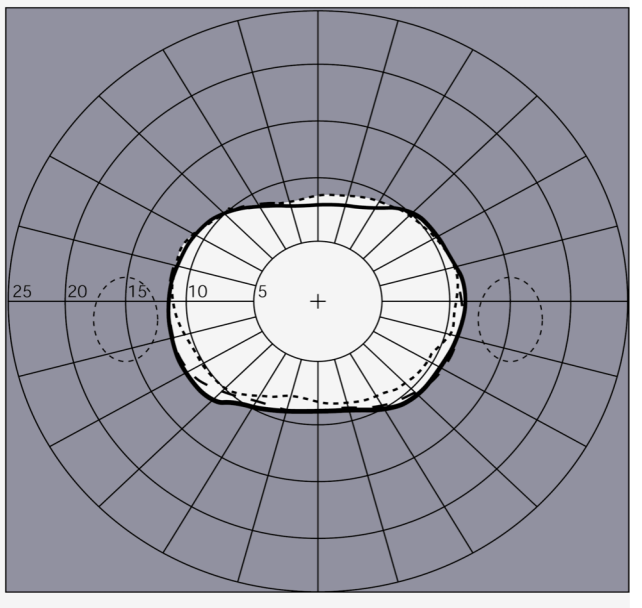
DIAGRAM 2 (courtesy E. Peli)

Autoplot



Remarks: DVI 2.2x Bioptic
Model I

Autoplot



Remarks: DVI 2.2x Bioptic
Politzer

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

APPENDIX 1

POLITZER TELESCOPIC LENS SERIES

PTS RESEARCH

PHASE II

RECORDING FORM

Patient Case #: _____ Date:_____

Disease type: _____

Testing Protocol:

		Dist	Near
Binocular VA with best-corrected spectacle Rx		10/	__M
Binocular VA with no Rx			
1. Politzer Rectangular	1.7x	10/	
2. Politzer / R 22 round	1.7x	10/	
3. Politzer / R 22 round with + 3.00 reading caps	1.7x		__M
Binocular VA with spectacle Rx			
4. Politzer Rectangular	1.7x	10/	
5. Politzer / R 22 round	1.7x	10/	
6. Politzer / R 22 round with + 3.00 reading caps	1.7x		__M
Monocular VA with no Rx			
7. Politzer BIO I	1.7x	10/	
8. Politzer BIO I	2.2x	10/	

Monocular VA with spectacle Rx

12. Politzer BIO I 1.7x 10/
13. Politzer BIO I 2.2x 10/
14. Are you currently using a spectacle telescopic system? Yes_____ No____

If yes, which one?_____

Do you prefer your current telescope? Yes____ No____

Do you prefer one of the new Politzer series telescopes? Yes____ No____

If yes, which telescope #'s do you prefer: with Rx____ without Rx____
with Rx____ without Rx____
with Rx____ without Rx____

How do the preferred aids help you?

Dist #_____

Near#_____

Dist #_____

Near#_____

Dist #_____

Near#_____

Amount of improvement over your current spectacle telescope

Telescope #____

Objective VA improvement Dist 10/ to 10/ Near __M to __M

Subjective % Dist _____ Near _____

Cosmetics. Agreeable____Objectionable____

Would you order this?

Telescope #____

Objective VA improvement Dist 10/ to 10/ Near __M to __M

Subjective % Dist _____ Near _____

Cosmetics. Agreeable____Objectionable____

Would you order this aid if the cost is $_____? Yes_____ No_____

Telescope #____

Objective VA improvement Dist 10/ to 10/ Near __M to __M

Subjective % Dist _____ Near _____

Cosmetics. Agreeable____Objectionable____

Would you order this aid? $_____? Yes_____ No_____