Clinical Evaluation of Bi expert® GP Bifocal Lens

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Currently, aspheric progressive multifocal contact lenses are the most popular method of correction for presbyopic patients interested in contact lens wear. Over the last few years, the manufacturing and lens design technologies have improved, making it possible for us to help patients with greater degrees and types of refractive errors. However, even with these newer lenses, on occassion, patients may note visual compromise at either distance or near, and unfortunately, there are some who cannot tolerate this compromise, especially in their distance vision. In this situation, a segmented bifocal contact lens is an alternative that can provide clear vision at both distance and near.

A study was conducted at the Michigan College of Optometry to determine if the Biexpert GP bifocal design provided a clinical benefit in the following areas: distance and near acuity, comfort, ease of fitting, corneal topography stability, and overall performance.

Biexpert is an alternating vision bifocal incorporating a unique inverse curve that fits the lower lid and provides natural lens translation for near vision. For comfort, slab off technology creates a thinner, uniform edge profile 360° around the circumference of the lens resulting in less patient lid awareness and improved wearing comfort. To maximize oxygen exchange, wetting characteristics and deposit resistance, the Biexpert lens is manufactured exclusively in Boston GP materials.[5]

Twenty-five randomly selected presbyopic patients were enrolled in this study. Prior to fitting, patients were informed that the Biexpert lens was created to provide clear distance and near vision only, without intermediate correction available. All lenses used in this study were provided by Art Optical Contact Lens Inc. and were ordered empirically based on refraction and K-readings. To improve first lens fitting success, the lab was provided with pupil size, horizontal visible iris diameter (HVID), a lower lid height to lower pupil margin measurement, lid position and lid tonicity details. *(See figure 1)*. The Biexpert parameters available for adjustment are: base curve (B.C), diameter, and segment height.

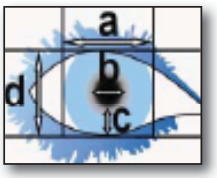


Figure 1

Base Curve

It is recommended to fit the Biexpert lens slightly on the steep side to ensure rapid vertical lens movement during blinking *(See figure 2)*. The first lens is chosen based on the patient's corneal astigmatism. [5]

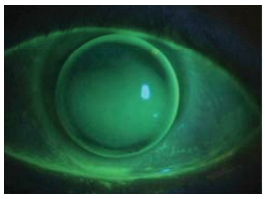


Figure 2

Apical Clearance

The Biexpert comes in five diameters (8.5, 9.0, 9.5, 10.0, 10.5mm). The initial diameter is selected based on the patient's HVID.

HVID	Diameter
<11.0 mm	8.5 mm
11.0 mm	9.0 mm
11.5 mm	9.5 mm
12.0 mm	10.0 mm
>12.0 mm	10.5 mm

Segment Height

Pupil size and lid height to lower pupil margin are the measurements used to determine the segment height. There are two red dots that indicate the segment location on the lens. You can adjust the height of the segment line based on the lens position. In primary gaze, the segment line should be adjacent to or just below the lower pupil margin. The segment line should not be within the pupil zone, and the lens should move 1-2mm after a blink, but it should drop quickly back into position so it won't interfere with distance vision.

Segment Height in relation to Diameter

Diameter	Segment Height	
8.50 mm	*max* 4.7	3.1 *min*
9.0 mm	*max* 4.9	3.3 *min*
9.5 mm	*max* 5.1	3.5 *min*
10.0 mm	*max* 5.4	3.8 *min*
10.5 mm	*max* 5.7	4.1 *min*

Michigan College of Optometry (MCO) Study

The 25 patients who were selected for the study were evaluated at the University Eye Clinic at MCO. They were monitored over a period of 3 months, and visits included the initial fitting, and follow-up at 1 week, 1 month and 3 months. More visits were required for patients who weren't successful from the first empirical fitting. An initial successful fit is defined as the first lens providing acceptable distance and near vision, good fit and comfort.

The study results follow:

- Eight patients (32%) were successful from the first empirical fit.
- A second lens with a minor adjustment (power and segment height) was ordered for four patients, and patients wore the lenses successfully after these adjust ments.
- Multiple lenses were ordered for three patients until the best fit and vision was reached.
- Overall, 14 patients (56%) were successful and satisfied with their visual acuity at distance and near, and found the fit and comfort of the Biexpert lenses acceptable.
- Those patients who failed to achieve a good fit or acceptable vision despite multiple adjustments were discontinued from the study after 3 or 4 attempts to improve the fit.

An Ideal Fit

- In primary gaze a slightly inferior position is desired.
- Segment line position adjacent to or slightly below the pupil at primary gaze.
- Lens rotation not more than 20 degrees nasally.
- 1-2mm of lens movement with the blink, however the lens should drop back into inferior position quickly.
- Adequate translation with inferior gaze (1 - 2mm above limbus)
- Alignment to a slightly steep fit is desired.

Nasal Rotation

It is desirable to have 15° to 20° of nasal rotation as the patient will be converging at near.[2] The nasal rotation will position the near segment in a good position for near vision. The base down prism axis is at 90° to get the 6 o'clock position. The Biexpert lens has an inverse curve at the lower edge of the prism to increase the contact area between the lens edge and the lower lid to enhance stability.

Figure 3

Good nasal rotation

Reasons for Poor Fit/Vision

The main problem most patients experienced was fluctuation of distance vision due to distance vision not clearing up immediately after the blink which interfered with their daily activities. In three patients the lens showed too much rotation and excessive movement caused the near segment to translate too far into the patient's pupil. The reason behind the excessive rotation *(Figure 4)* and poor stability was most likely due to their lid position and tonicity. Most of these patients had a lid attachment to a certain degree. Some had excessive lid attachment to the point the lens was picked up by their upper lid and they were constantly looking through the near segment. Others had a slight lid attachment that prevented the lens from dropping back quickly into the proper position causing distance blur that could last more than 1-2 seconds.

Figure 4

Excessive rotation

If one were to try to correct this problem, they would want to increase the prism or make the lens thicker (heavier) so it would drop more quickly. Unfortunately, at the time of our study this option was not available, but currently the Biexpert lens can be ordered with more prism to increase the lower edge thickness.

Steepening the lens causes the lens to drop quicker, while a flatter lens tends to ride high[3]. Since the lens is fit on the steep side to begin with, one needs to be aware of bubbles and debris getting trapped under the lens. Another way to troubleshoot for excessive rotation is to decrease the overall diameter of the lens. This lessens the upper lid contact, and helps stabilize the lens.

Near vision was also a problem in some patients. If the lenses didn't translate well, the patient's pupil was not aligned with the near segment. To improve translation, the diameter of lens was increased. After follow up, patients showed improved near vision which indicates that vision improves as the patient adapts to the Biexpert lenses.

Improving Distance Vision

When it comes to improving distance vision, always assess the segment height in primary gaze. If the segment line is too high and it is bisecting the pupil, choose a lower segment height. A small change in the segment height will make a big difference. If the patient is complaining of distance blur, dropping the segment line 0.10 – 0.20mm can help keep the segment line below the pupil after a blink. ***Tip:*** Assess segment height with cobalt blue light to avoid pupil constriction with bright white light[1]. Using Fluorescein stains the segment line, making it easier to observe in case the two red dots are no longer visible. The segment line should be adjacent or below the lower pupil margin.

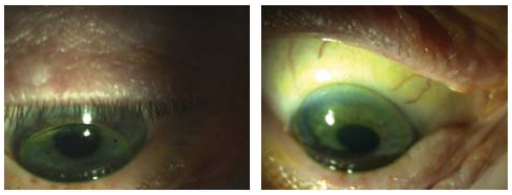
If the lens is moving excessively or rotating and it is affecting distance vision, it is recommended to steepen the base curve to allow the lens to drop quickly into the proper position. If this isn't successful, the next step would be to increase the diameter and keep the original base curve. The larger diameter will make the lens steeper and heavier causing it to become more stable. If neither of these solutions is effective, and the lens still has excessive rotation, the last attempt would be to decrease the di-

ameter and steepen the base curve. Making this modification decreases the chance of the lens getting picked up by the upper lid, while keeping the same fitting relationship. If the patient's poor distance vision is due to residual astigmatism, Biexpert lenses can be ordered in a front toric design. If the lens is not wetting properly, the patient's vision will fluctuate. Choosing a lower Dk material like Boston ES, should improve lens wettability. Plasma treatment of the lens can also help improve wettability.

Improving Near Vision

When the near vision is decreased, ask the patient to look down and see if the lens translates above the upper limbus *(Figure 5)*. This ensures that the patient is looking through the near segment. If there is poor translation, and the lens slips under the lower lid, increase the overall diameter. When the patient's lower lid is positioned below the limbus, this creates a situation where the lens does not translate as well as it should. Increasing the diameter should take care of this problem. If the lens is translating well and the patient's lower lid is adjacent to the limbus, but the patient still having problems at near, increasing the segment height slightly will help the patient to see through the near segment. ***Tip:*** Increase the segment height by 0.20mm at a time.

Figure 5



Add Power Selection

At the beginning of the study, it was surprising how most of the patients required less add than their spectacle add power. The add power should be determined based on where the patient likes to hold the reading material, not at a 40cm distance. Some patients with long arms like to hold things at 50cm, and therefore need less add power than predicted. The minimum add power that can be ordered with the Biexpert is +1.50. So it is important to always measure the patient's reading distance before ordering the lens.

Patient Selection

After completing this study, I believe patient selection is the most important step in helping decide which type of multifocal GP lens to fit. Always consider the patient's refractive error, visual needs, occupation, hobbies, contact lens history, and how the patients plan to wear their lenses, (for specific visual tasks)[4]. The practitioner should have an idea about patient expectations before an initial lens design is chosen. A patient who wants to see 20/15 at all distances all the time, is typically not a good candidate for any presbyopic contact lens. Observe the patient's eyelid characteristics. The lids play a significant role in fitting translating designs. Optimally, the lower lid should be at or within 1-2mm from the lower limbus.

Poor Candidates

- Computer users or patients who need their intermediate distance vision most of the time.
- Extreme dry eye patients - cases where wearing time is limited to 3- 4 hours a day.

Good Candidates

- Patients with critical vision demands, who require uncompromised distance and near vision.
  Example: A patient who wants to be active or watch T.V and read would benefit from the Biexpert.
- Patients who failed to achieve satisfactory vision at near with aspheric multifocal designs.
- An existing GP lens wearer.

Fitting Pearls

- Order the lenses empirically based on keratometry, refraction, and add power.
- Provide the lab with pupil size, HVID, distance between lower pupil margin and the lower lid to increase fitting success.
- Let the lenses settle for 5 minutes and then take distance and near visual acuity monocularly and binocularly.
- Use loose lenses to achieve best corrected visual acuity.
- If distance acuity was not corrected to 20/20 perform a spherical/cylindrical over refraction.
- If the lower lid is positioned above the limbus, start with a small diameter (9.0mm).
- If the lower lid is below the limbus, choose a larger diameter (9.50) to facilitate lens translation.
- Start with a segment height of 4.5mm and then adjust accordingly.
- Make sure the patient is using their eyes when looking down instead of just dropping their head. Looking down will cause the lower lid to push the lens toward the superior limbus.
- Test near vision using newspaper print or the patient's cell phone - it gives a better idea of what the patient will see in the real world.

Summary

Biexpert is a new translating bifocal GP lens option that provides good distance and near vision with careful patient selection. Patients who are seeking uncompromised distance and near vision will be great candidates. In addition, the fitting nomograms for this lens are simple and easy to follow.

References:
1. Comparison of scotopic pupil measurement with slitlamp-based cobalt blue light and infrared video-based system Volume 28, Issue 11, Pages 1952-1956 (November 2002)
2. Contact lens prescribing and fitting, Milton M. hom
3. A rational approach to fitting multifocal lenses, by Robert L. Davis, http://wwwCLspectrum.com/article.aspx?article=103882
4. http://www.clspectrum.com/article.aspx?article=12447
5. http://www.artoptical.com/lenses/detail_special_lens_designs/Biexpert

Bassima Al-delaigan, O.D. received her Bachelor of Optometry at King Suad University, (Optometry division). Dr. Al-delaigan then worked in a tertiary eye hospital (King Khaled Eye Hospital) in Ridyadh, Saudi Arabia for five years, the last two as a contact lens specialist with emphasis on Keratoconic lens fitting. She received her Doctorate of Optometry from the New England College of Optometry in Boston. Dr. Al-delaigan is a member of the AOA, and is very interested in contact lens fitting and teaching.

As a proud supporter of the Cornea and Contact Lens Residency Program at Michigan College of Optometry, Art Optical was honored to work with Dr. Al-delaigan, the 2009-2010 Cornea and Contact Lens resident. As part of her residency, Dr. Al-delaigan was responsible for conducting/coordinating clinical research studies pertaining to GP contact lenses, and this paper is a result of that work. Dr. Al-delaigan has since returned to Saudi Arabia where she will continue to develop her expertise and interest in specialty contact lenses.