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## Refitting successful daily wear GP patients into thirty day continuous wear gas permeable lenses: A case series

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## **Refitting successful daily wear GP patients into thirty day continuous wear gas permeable lenses: A case series**

### **Abstract**

Current rigid gas permeable lens wearers were refit into the thirty day continuous wear Menicon Z gas permeable lens. The purpose of the study was to evaluate how the subjects transitioned to the new Menicon Z lenses and the thirty day wearing schedule. Subjects were monitored for two months for an ocular health changes by assessing visual acuity, performing biomicroscopy and lens fit evaluation, and corneal topography.

### **Degree Type**

Thesis

### **Degree Name**

Master of Science in Vision Science

### **Committee Chair**

Jennifer Smythe

### **Subject Categories**

Optometry

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**REFITTING SUCCESSFUL DAILY WEAR GP PATIENTS INTO THIRTY DAY  
CONTINUOUS WEAR GAS PERMEABLE LENSES: A CASE SERIES**

By

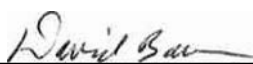
**David E. Bauer  
Danelle F. Moch**

**A thesis submitted to the faculty of the  
College of Optometry  
Pacific University  
Forest Grove, Oregon  
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Doctor of Optometry  
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Authors:

  
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**David E. Bauer**

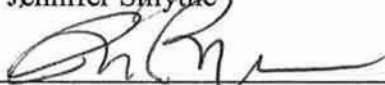
  
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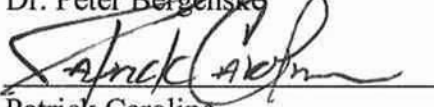
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## Biographies:

David E. Bauer graduated **from** University of North Dakota-Williston with an Associate of Arts and Associate of Science degree in May 1998. He continued on to Pacific University where he received a Bachelor of Science degree in Visual Science in May 2001. David is currently a fourth year optometry student at Pacific University College of Optometry. He hopes to practice in the upper Midwest upon graduation.

Danelle F. **Moch** graduated *summa cum laude* **from** the University of Mary with a B.S. in Biology in May 2000. She pursued her long-time dream of **becoming** an optometrist by continuing her education at Pacific University College of Optometry, **from** which she will graduate with her doctorate of optometry in May 2004. Danelle hopes to practice primary care optometry in the upper Midwest with a focus in contact lens.

Abstract: Current rigid gas permeable lens wearers were refit into the thirty day continuous wear **Menicon Z** gas permeable lens. The purpose of the study was to evaluate how the subjects **transitioned** to the new **Menicon Z** lenses and the thirty day wearing schedule. Subjects were monitored for two months for an ocular health changes by assessing visual acuity, performing biomicroscopy and lens fit evaluation, and corneal topography.

### **Acknowledgements:**

**We would like to thank Consice and Carl Moore for their support of our study by providing us with the Menicon Z lenses for our subjects. Thank you to Jennifer Smythe, Peter Bergenske, and Patrick Caroline for their guidance and support of our project. To our subjects, thank you for being an integral part of our research!**



## **Refitting Successful Daily Wear GP Patients into Thirty-Day Continuous Wear GPs: A Case Series. By David Bauer, Danelle Eider, Jennifer Smythe, OD, MS, FAAO, Peter Bergenske, OD, MS, FAAO, Patrick J. Caroline, COT, FAAO**

### **Introduction**

Although contact lenses are considered a viable alternative to spectacles for many, they require a lot of maintenance and increase the risk of anterior segment complications in wearers. For years, contact lens manufacturers and eye care practitioners have been yearning to make contact lens wear and care more opportune. The simple answer would be increased wear-time without intensified risk for associated complications. Not only would this offer convenience to patients, but it also provides an attractive alternative to **refractive** surgery. Extended-wear with traditional **hydrogel** and gas permeable lenses seemed like a viable answer, but years of previous experience has shown that the decreased oxygen available to the cornea with these modalities can lead to many adverse events.<sup>1,2</sup>

The infiltration of hyper-Dk materials into the contact lens marketplace has allowed the practice of continuous wear to emerge. The idea of wearing a lens for thirty consecutive days with very minimal increased risk over daily wear is very appealing to most wearers. Not only is less handling and care enticing, continually corrected vision in all circumstances is also very appealing. Silicone hydrogels have revolutionized the soft contact lens industry, but their commonplace left gas permeable (GP) wearers longing for the same convenience.

On July 16, 2002, the FDA approved **Menicon Z** (tisilfocon A) lenses for 30-day continuous wear in the United States. The gas permeable lens material is a combination of siloxanylstyrene and fluoro-methacrylate. It offers a Dk of 189 using the Fatt **polarographic method**.<sup>1,3</sup> This converts to a Dk/L value of 125 with a 0.13 **mm** center thickness in the **Menicon Z Thin** design. Historically, highsuper-Dk gas permeable lenses had lowered mechanical strength. The addition of styrene to the mix in **Menicon Z** brings increased rigidity. This permits for a thinner lens design without the threat of flexure and breakage. The **Menicon Z** design is aspheric, which eliminates spherical aberration and provides superb visual acuity. It is also surface-treated to increase wettability and decrease lipid uptake. Currently, **Menicon Z** is the only gas permeable material that is FDA approved for continuous wear. The lens is available in powers ranging **from** -20 D to +12 and many different designs including bitorics and multifocals.<sup>3</sup>

### **Methods**

Our study was designed to examine the ease with which **successful** daily wear GP patients could be transitioned into the continuous wear modality with the **Menicon Z** material. We recruited ten **successful** DW patients that fit the criteria recommended for **extended/continuous** wear. All recruits needed to be **free** of lid disease, corneal infections and dystrophies, keratoconus, history of penetrating corneal surgery, diabetes,

and pregnancy. Tear film on subjects was examined to make sure it was suitable for a continuous wear schedule. A good tear layer that is **free** of excess lipids and debris is essential in continuous wear since the lenses are cleaned on a less frequent basis. The dry ocular environment during sleep can intensify any preexisting tear film challenges. The presence of significant corneal staining prior to the start of continuous wear is also **contraindicated**.<sup>1,2,4</sup> Eligible candidates could not currently be wearing lenses on an overnight or extended wear basis and were required to have had a comprehensive eye exam within the immediate 12 months preceding the commencement of their initial study visit and fitting into the **Menicon Z** lens.

At the initial visit, final eligibility was confirmed and a diagnostic fitting, according to the manufacturer's fitting guide with reference to the present parameters, was conducted. The ideal fit for a continuous wear lens is well centered with minimal apical clearance that offers a wide peripheral tear reservoir. This allows the lens to move **freely** with blink and gaze excursions, ensuring proper tear exchange under the lens.<sup>1,4</sup> The easiest way to achieve this relationship is with a lid-attached, alignment fit. An exceptional fit is more essential to continuous wear success and we set this ideal as our goal with each of our subjects.<sup>4</sup>

An entrance questionnaire examining current satisfaction in DW and motivation for CW **and/or** refractive surgery was also completed. Subjects were then given information on the **Menicon Z** material and continuous wear modality to help them understand the possible risks associated with being a part of the study, including a list of potential adverse events. The patients were required to review the information in office and were then given an opportunity to ask questions about the process. The final step was signing an informed consent. Patients returned for a dispense visit as their lenses arrived. All lenses were dispensed with the **Lobob** Optimum care system, as well as care instructions. The patients were then followed on a one-day, one-week, one-month, and two-month schedule. Subjects were instructed to report all adverse events immediately and schedule **emergency** visits as necessary.

At each follow-up visit, fit, visual acuity, ocular health, ocular topography and patient perception were evaluated. **Extended/continuous** wear with gas permeable lenses is traditionally associated with fewer complications than an equivalent oxygen transmissible **hydrogel** lens. Complications are more predictable and very similar to those encountered with DW of **GPs**, but they occur at an accelerated rate and mandate a closer follow-up program. Specific complications to watch for with continuous wear include signs of hypoxia (striae, folds, and microcysts), lid complications (papillary hypertrophy and induced ptosis), conjunctival and corneal staining (particularly limbal desiccation/ **3** and **9** o'clock staining), adherence, inflammation (vascularized limbal keratitis), and **infection/ulcers**.<sup>1</sup> Our biggest concerns with the CW modality were adherence and accelerated **3** and **9** staining. The CCLRU grading scale was used to monitor any onset and progression of these complications at each visit.

At the completion of the two-month follow-up period, patients were asked to subjectively compare, comfort, vision, and overall satisfaction with CW of the **Menicon Z** material to their prior DW lenses.

The following case reports detail our course in refitting ten, successful daily wear GP patients into thirty day CW of **Menicon Z** lenses. They include the tribulations encountered along the way and the processes attempted to manage them.

## Case Reports

### Subject 1

S.C., is a 38 yo white male optometrist who started wearing PMMA lenses in 1980. In 1986, he was refit into RGP lenses.

On the initial fitting visit, S.C.'s ocular and medical health was unremarkable except for seasonal allergies. His habitual GP lenses fit well and had the following parameters:

OD: 8.119.51-8.25

OS: **8.1/9.5/-8.75**

Biomicroscopy revealed 1+ conjunctival redness and 1+ 3 & 9 staining. All other findings were unremarkable.

S.C. was empirically fit with the 8.1 base curve, 9.6 diameter **Menicon Z** Aspheric lens OU. The prescription in the lens was modified slightly due to **over-refraction** of his current lenses and the patient's desire to have less minus prescribed in his lenses. S.C. was aware that his current lenses contained more minus than his **refractive** error required and felt that by removing this excess minus he may note increased comfort with extended near work. The following powers were ordered: -7.75 OD/-8.25 OS.

On dispense, lenses fit well with minimal apical clearance and lid attachment similar to his habitual RGPs. Vision **thru** the lenses was 20/20+ OU. S.C. did notice a slight blurring immediately **after** blinking. The blurring subsided **after** the lenses settled. We had him wear the lenses only during waking hours until we could see him for the 1-day visit **after** overnight wear.

After the **first** night of overnight wear, S.C.'s vision was 20/15+, unchanged **from** his habitual lenses. Biomicroscopy was unremarkable except for the 3 & 9 staining previously noted. The lens fit was ideal, with no change **from** the dispense visit. No lens adherence was noted.

S.C.'s first impression was positive. He commented that he did not notice he had the lenses in his eyes. The only complaint was acuity in low lighting conditions suffered. We decided to have the patient wear the lenses for a **full** week and then re-evaluate the decreased acuity at that time.

The 1-week visit showed 20/15+ acuity thru the lenses. The fit was unchanged from the dispense visit as were the biomicroscopy findings. No lens adherence was noted.

Because S.C. was continually noticing decreased acuity with dim illumination, we decided to order a slightly larger lens to incorporate a bigger optical zone. A 9.8mm lens was ordered with all other parameters staying the same. At dispense of the second lenses, S.C. still exhibited the 3 & 9 staining that was present at his initial visit. Comfort was still excellent, and in fact, he again noted he was unable to tell he had the lenses on.

The second pair of lenses was dispensed two weeks after his initial lenses were dispensed. The fit was acceptable, though slight apical clearance was noted. Biomicroscopy was again unchanged from the first visit. We had S.C. wear them during waking hours over the next 3 days until Monday when he could be evaluated the morning after sleeping in them for the first night. Again, at this visit, no adherence was noted and we decided to follow-up in one month.

At the 1-month visit, S.C. once again commented on how comfortable the lenses were. The acuity issue had been slightly resolved with some lingering glare at night. He attributed it to possibly being slightly under-minused. He did successfully wear them the entire month.

All biomicroscopy findings were excellent. The 3 & 9 staining seen previously was not noted in the left eye but still at 1+ in the right. He did exhibit 2+ conjunctival redness and 1+ limbal redness that he says is normal for him during the spring. The fit was not changed from before, being acceptable but slightly steep.

At the final 2-month visit, very little had changed from the initial visit. Biomicroscopy revealed the same findings as the 1-month visit, with the addition of 1+ 3 & 9 staining in the left eye. S.C. once again commented on the comfort of the lenses.

We followed up on each of the patients one month after their final visit. S.C. did say he still wears the Menicon lenses overnight a few nights in a row. He did mention that if he desires crisp evening vision, he wears his habitual lenses as they give better night vision.

## Subject 2

Our second subject, J.S., is a 33 yo white female optometry student who has been wearing RGP lenses for 17 years. She alternates between two different lenses: CAD and Thinsight. Parameters: +6.00D OU; Base curve 8.10 OD/ 8.06 OS; OAD 9.5mm. She notes satisfactory vision and comfort with both sets of lenses. She did mention protein buildup has been a problem for her.

Initial biomicroscopy exam did show slight front surface deposits on her right lens and mild front surface deposits on her left lens. There was trace conjunctival and limbal redness OU, possibly 1+ in the left eye. She also had 2+ 3 & 9 staining OU.

We diagnostically fit J.S. with a 8.15 base curve and a 9.6 diameter lens in the right eye and achieved an acceptable fit. The left eye was fit with an 8.10 lens after several attempts, which also was judged acceptable. Over-refraction led us to a final lens prescription of +5.75D OU. We ordered **Menicon Z Thin** lenses for this patient.

On her dispense visit, the vision, fit and corneal health was unchanged from the fitting visit. Trace corneal **neovascularization** was observed (<1.0 mm).

The new **Menicon Z Thin** lenses exhibited an ideal lens/corneal fitting relationship on the right eye, however moderate apical clearance was noted on the left eye. Because the ideal fit was not obtained on the first fitting, we ordered a 8.15 BC with +6.00 with anticipation of achieving the ideal lens/corneal fitting relationship. We had the patient wear the new pair of lenses on a daily wear basis for 1 week to help settle her into the new material. The patient was concerned that the new lenses weren't as comfortable as her old lenses, but she said she would give them a try. **After** the first night of sleeping in the lenses, the patient still was not happy with their overall **comfort**. She was also **afraid** of developing **dellen**, which she has had in the past. A mutual decision was made to release her **from** the study and resume traditional daily wear with her habitual lenses.

### Subject 3

Our third subject, V.S., is a 45 yo white female who has been a contact lens wearer since she was 10 years old. She was initially placed in PMMA lenses with optimism of controlling her myopia. Her current HDS lenses afford her good vision and comfort with the only complaints being dryness towards the end of the day and halos around lights when driving at night. The other issue she reported is that her right lens had a tendency to fall out when she sneezes.

Her current lenses are HDS lenses with the following parameters:

OD: 7.40/9.10/-6.25

OS: 7.40/9.10/-5.75

We diagnostically fit V.S. with the **Menicon Z Alpha I** lenses in the following parameters:

OD 7.45/9.6/-6.75

OS 7.40/9.6/-7.00

Biomicroscopy during the initial exam yielded trace conjunctival redness, trace 3 & 9 staining in the right eye, 1+ 3 & 9 staining in the left eye, and 2+ SPK inferior to the central cornea in the left eye. Her habitual lenses were lid-attached and had a flat fitting alignment with the cornea showing slight apical touch.

At the dispense visit, vision, fit, and corneal health was unchanged with the addition of trace **limbal** redness. The new lenses had good movement and an acceptable corneal fitting relationship. Visual acuity was assessed to be 20/15 in both eyes. We had V.S.

leave with the new lenses and she was to sleep in them that night and return the next morning.

V.S. came back early the next morning for her 1-day visit. She said vision was excellent and she experienced fewer halos while driving. She also commented on how comfortable the lenses were.

**Biomicroscopy** revealed an concerning **find**. The **left** lens fit was unchanged **from** the dispense visit and was moving well on the cornea. However, the right lens was adhered to the superior nasal cornea. We questioned V.S. about the comfort of the lens and eye in general, to which she commented it was "very comfortable".

Adherence with extended-wear GP lenses is of major concern for practitioners. As mentioned with V.S., discomfort is usually not noted by the patient, leading them to feel their lenses are fitting well. In severe cases of adherence, symptoms may include slight VA decrease, as well as spectacle blur and conjunctival injection- "Signs include a nonmoving lens with trapped mucus and debris behind the lens, corneal indentation, central punctate staining, peripheral arcuate staining, and corneal distortion. Most of these signs disappear **within 2 hours of** the onset of lens **movement**, however, patients should be **examined as** early **as possible** after awakening to detect them." Studies show rates of adherence with extended wear contact lenses to range from 10-48%.<sup>5</sup> Adherence can cause serious corneal complications including corneal distortion, **dellen** formation, and corneal ulceration. To correct adherence, many steps can be taken. Reducing lens diameter, fitting with minimal apical clearance, and the use of wider and flatter peripheral curves can all help minimize the complication of adherence. If adherence continues to be a problem, daily wear of the material may be the best alternative for the patient. To free an adherent lenses, rewetting drops are applied and slight digital massage can be used.<sup>1,5,6</sup>

In V.S.'s case, we instilled rewetting drops into the right eye every minute to **try** to **free** the lens from the cornea. After several unsuccessful attempts at using rewetting drops, we used gentle digital massage **thru** the eyelids. **After** a brief period of digital massage, the lens was still adhered to the corneal. We again instilled several rewetting drops and repeated the digital massage. After two attempts, the lens began to move **freely**.

**After** the lens was **freely** moving, we instructed the patient to use rewetting drops every hour to help with any discomfort she may experience **from** a disrupted cornea. The subject was instructed to wear her lenses on a daily-wear basis until new lenses arrived. We decided to fit V.S. with a slightly steeper lens as the previous fit showed slight apical bearing OU. The following lenses were ordered:

OD: 7.4019.601-7.25

OS: 7.3519.601-7.50

The second dispense, approximately 2 weeks later, revealed trace conjunctival and limbal redness and +2 SPK in the **left** eye.

The new steeper lenses had an ideal lens/cornea fitting relationship, afforded good movement and 20115 vision. The patient said comfort and vision were excellent so we had her wear the lenses during the day until we could evaluate the lenses the morning after initial overnight wear again.

The one-day visit with the new right lens demonstrated no adherence in either eye and movement of the contact lenses was excellent with both blink and gaze excursions. The corneal fitting relationship was slightly steep, showing apical clearance but the fit was deemed acceptable. Biomicroscopy showed trace 3 & 9 staining OU.

At V.S.'s 1-week visit, she again commented on the comfort of the lenses and she was seeing 20115. She commented on how great it was to sleep in the lenses. The corneal fitting relationship and biomicroscopy was unchanged from the one-day visit.

The 1-month and 2-month visit was unchanged from the 1-week visit. At the 2-month visit, the patient still loved the convenience of the modality.

When following up with V.S. about her new lenses one month after the study, she still loves the modality and wears them continuously for up to 30 days.

#### Subject 4

Our third subject is T.C., a 43 yo white female who was been wearing rigid lenses for 25 years. T.C. liked the comfort and vision her habitual lenses gave her. We were unable to determine what brand of lenses she currently was wearing but they had the following parameters:

OD: 7.90/9.30/1-8.50

OS: 7.90/9.30/-8.50

Vision thru these lenses was 20120 OD, 20130 OS.

T.C.'s personal ocular and medical history was unremarkable.

Biomicroscopy showed a well fitting lens that was decentered inferiorly OU. All ocular findings were unremarkable with the exception of trace 3 & 9 staining OU.

We diagnostically fit T.C. with the following lenses that provided an excellent lens to cornea fitting relationship:

OD: 7.85/9.60/1-8.00

OS: 7.85/9.60/1-8.00

At the dispense visit, the biomicroscopy exam was unchanged from the initial visit. The new Menicon Z Alpha I lenses showed an ideal lens/cornea relationship and gave 20125 vision monocular and 20120 OU.

After the first night of overnight wear, T.C. was very happy with the lenses. Vision improved to 20/15 and the fit was still unchanged from the dispense visit. No adherence was noted. Biomicroscopy did reveal a small amount of SPK and 2+ 3 & 9 staining OU.

At the one-week visit, the patient was very happy with the comfort of the lenses and the idea of sleeping in the lenses. Vision was 20/20+ in both eyes. The patient did comment that vision was a bit cloudy in the morning but **after** instillation of wetting drops, this quickly subsided. The lens still fit very well with an excellent corneal fitting relationship. There was trace conjunctival and limbal redness OU, as well as trace 3 & 9 staining OU.

The one-month visit was unchanged from the one-week visit.

The patient was still thrilled with the lenses at the 2-month visit. Vision was 20/15 and the lenses still exhibited an excellent lens/cornea relationship. Biomicroscopy was unremarkable with only a small area of concern for us. There was a small area of possible inflammation in both peripheral corneas at 9:00. The patient did not notice any irritation from these small (<1 mm) whitish areas. We decided to have the patient wear the lenses during only waking hours for the next two days and recheck the area of concern at that time.

At the follow-up visit, the inflammation was still present but much less noticeable. The area on the right cornea did superficially stain with sodium **fluorescein** but the area on the left eye did not. We decided they did not pose a risk for infection or any **further** problems but we did discuss with the patient that she should wear her lenses only 2 weeks of overnight wear and then remove.

#### Subject 5

Our **fifth** subject, K.S. is a 25 yo white female who has worn RGP lenses for 10 years. Her personal ocular and medical history was unremarkable. Her current lenses were Horizon 30, and had an ideal fitting relationship. Vision thru her habitual lenses was 20/15. The habitual lenses have the following parameters:

OD: 7.9019.301-6.00

OS: 7.9019.301-6.00

Biomicroscopy showed trace 3 & 9 staining and trace inferior temporal SPK OU.

We diagnostically fit K.S. and achieve a desirable fit with the following lenses:

OD: 7.8519.601-6.00

OS: 7.95/9.60/-6.00

At the dispense visit, the new **Menicon Z** Alpha I lenses showed an ideal **lens/cornea** fitting relationship. Vision was 20/15 thru the new lenses. K.S. did comment the **Menicon** lenses were not as comfortable as her habitual lenses. Biomicroscopy remained unchanged from the fitting visit.



The one-day visit was unchanged **from** the dispense visit. K.S. commented again about the decreased comfort compared to her habitual lenses and also commented her vision was not as crisp with the new lenses despite the matching visual acuity of 20/15.

**After** one-week of continuous wear, K.S. noted that she would rather remove the lenses during the night due to awareness of the lenses during resting hours. At this visit we did note 2+ limbal redness. K.S. noted that this wasn't too uncommon for her, but we had her come back 2 days later to see if this finding persisted. At the follow-up visit the limbal redness was decreased to a trace level.

At one month, K.S. was moderately satisfied with continuous wear. She still commented that she would rather only wear the lenses during waking hours but for the sake of the study she would continue with overnight wear. Biomicroscopy was very similar to the previous visit. Slight conjunctival redness was observed as well as slight 3 & 9 staining. She also exhibited trace inferior corneal staining OS.

At the final visit, findings were unchanged **from** the one-month visit. At both the **one-** month and two-month visit, we did notice very slight **front** surface deposits on both lenses. K.S. reported that the lenses felt dirty to her and admitted to cleaning them weekly. We feel the surface deposits are the reason for her description of dirty lenses.

#### Subject 6

K.M.S is a 24-year-old white female nutritionist currently wearing a unknown Boston design gas permeable lens that was 2+ years old. K.M.S reported that she "loves the acuity" her habitual GPs offer her as she had worn **hydrogel** lenses **unsuccessfully** for years. She had no accounts of adverse events to report and the lenses remained comfortable for 16 to 18 hours of wear. Her systemic health was unremarkable and some mild ocular allergies were reported. She reported taking birth control medication.

Habitual GP parameters and acuities:

OD: 7.4/9.5/-9.50 20/15-

OS: 7.4/9.5/-8.75 20/15-

**At** the entrance **examination/diagnostic** fitting, K.M.S presented with slightly steep fitting GP lenses that had excess apical clearance and bite 360 degrees OU with blink. Biomicroscopy showed 1+ **front** surface deposits OU, 1+ conjunctival redness OU, 1+ generalized SPK OS, and 1+ 3 and 9 staining temporally OU. Several trials were attempted during the diagnostic evaluation and final lens parameters were ordered in the **Menicon Z** aspheric design as follows:

OD: 7.50/9.6/-8.25

OS: 7.40/9.6/-7.75

K.M.S returned several weeks later for her dispense visit. The **Menicon** lenses centered well, had slight apical clearance, and were recorded as an acceptable fit yielding good vertical movement with blink. Biomicroscopy revealed trace 3 and 9 staining OU.

**K.M.S** saw 20115- through the new lenses and reported immediate comfort. She was released to sleep in the lenses overnight and was instructed to return the following morning for her one-day follow-up. In the morning, **K.M.S** reported that the lenses were comfortable while sleeping and on waking, but she felt that her acuity was not quite as sharp, especially while driving at night. Acuities were 20/20+ OD and a slow 20/20 OS. The fit still looked acceptable and biomicroscopy revealed 1+ 3 and 9 staining OU. Spherical over refraction yielded plano OD and -0.50 OS. A new OS lens was ordered incorporating the over refraction finding and **K.M.S** was released to wear the lenses on a CW basis until her next visit.

At the one-week visit, **K.M.S** presented with 20/15 acuity OD and 20/30+ OS. She reported that the lenses were very comfortable and that she would be totally satisfied if her acuity were just a little sharper. The lenses were still fitting appropriately and biomicroscopy revealed 1+ 3 and 9 staining OU. The OS lens was swapped for the new -8.25 power, which generated 20/15 vision. **K.M.S** returned for her one-month visit completely pleased with the modality. She had worn them every night since her last visit without any concerns or complications. Visual acuities were 20/15- OD and OS. Biomicroscopy revealed an acceptable fit, 1+ front surface deposits, 1+ conjunctival redness, and a trace of 3 and 9 staining temporally OU. She was directed to remove, clean, and store the lenses overnight in the Optimum disinfecting solution. She could resume CW the following morning and continue until her final two-month visit. At the final follow-up visit, **K.M.S** reported that she was still doing very well in the lenses. Comfort was reported as satisfactory and the only minor concern was some glare noticed at night. Visual acuities were again 20/15-. Biomicroscopy revealed 1+ surface deposits OS, 1-2+ conjunctival redness OU, a trace of limbal redness OU, and 1+ generalized inferior SPK in conjunction with 3 and 9 staining OU. Upon further questioning, **K.M.S** did not report any increased irritation or lens intolerance over the past month. She was released from the study to continue with the modality as she strongly desired. A follow-up call made 5 months post study conclusion revealed that she was still wearing the lenses very successfully on a CW basis.

#### Subject 7:

**J.M.**, is a 25 year old white male third-year optometry student. **J.M.** has been a GP wearer since the age of 13 and is currently in the CAD design. He reported that vision through his current lenses was "pretty good" and that the lenses were "comfy", although his eyes often appear irritated. Ocular history was significant for spectacle blur, but otherwise unremarkable for any adverse events. Entering acuities were 20/15 OD and OS, with 20/15+ OU. The habitual lenses were fit inter-palpebral with adequate apical clearance and movement with blink. Biomicroscopy at the entrance exam revealed 1+ front surface dryness OD, 1+ conjunctival redness OU, 2+ limbal redness OU, 1+ papillary conjunctivitis on the superior tarsus OU, 2+ 3 and 9 staining OD, and 1+ 3 and 9 staining OS. Habitual GP parameters:

OD: 42.25/9.0/-1.88 spherical over refraction plano

OS: 41.87/9.0/-1.50 spherical over refraction plano

Menicon Z aspheric lenses were ordered empirically using J.M.'s current parameters.

OD: 8.00/9.0/-1.75

OS: 8.10/9.0/-1.25

The new lenses yielded 20/15- acuity OD and OS with an acceptable inter-palpebral fit with adequate movement and edge lift. J.M. reported initial comfort and was excited to begin overnight wear. Biomicroscopy revealed much whiter eyes at this visit with only 14 3 and 9 staining being recorded. Spherical over refraction was -0.25 OD and OS. J.M. was released to wear the lenses on a daily wear basis for three days then overnight on the third day.

On the morning after the first night of wear, J.M. presented with 2-3+ conjunctival redness, 1+ limbal redness, 1+ SPK, and 2+ 3 and 9 staining OU. He was concerned about the increased redness, but reported that his eyes felt "okay" and that vision was unaffected. An indentation line could be seen OU on the inferior cornea where the lenses had been resting overnight. The inter-palpebral fit was again judged acceptable. Visual acuity was 20/15- OD and 20/15 OS. He was instructed to wear the lenses on a DW basis only until the redness subsided and to pay attention for any symptoms of adherence. He was instructed to contact us and remove the lenses if any increased redness/discomfort ensued. The lenses were worn comfortably on a DW basis until the redness resolved. At this point, overnight wear was attempted again with the same complications resulting. J.M. reported an intensifying foreign body sensation as he attempted to leave the lenses in throughout that day until his appointment. Fit was appropriate with adequate edge lift and the patient had not noticed any symptoms of adherence. The acute red eye noted twice after sleeping in the lenses presented similar to episodes of CLARE with unknown cause. A mutual decision was made between participant and the study investigators to release him from further attempts at CW. At last follow-up, J.M. was still wearing the lenses on a DW basis and was very satisfied with them under this schedule.

## Subject 8

L.B., a 29 yowf administrative assistant had been a successful GP wearer for the past decade or so upon entering the study. She had long desired to be able to see the TV as she fell asleep at night and tell the time on the alarm clock in the morning. Her ocular and systemic histories were unremarkable and she was currently taking oral birth control. Her habitual lenses were of an unknown design and material, but the following parameters were measured during the entrance exam:

OD: 7.75/9.5/-8.00

OS: 7.70/9.5/-8.25

Visual acuity through L.B.'s habitual lenses was 20/20+ both OD and OS. She mentioned some concerns about end of the day dryness and general itchiness with the lenses. On biomicroscopy, the lenses were free of any surface deposits and had a very acceptable lid attached design. The only anterior segment finding that was noted was 1+ general conjunctival redness. After several attempts with different diagnostic lenses in the Menicon Z Alpha I design, the following lenses were ordered:

OD: 7.80/9.6/-7.75  
OS: 7.65/9.61-8.50

At dispense, the **Menicon Z** lenses produced 20/20+ vision OD and OS, with a solid 20/15 OU. The lenses centered a touch inferior and were not lid-attached, but they moved well with blink and the fit was recorded as acceptable. Biomicroscopy yielded no significant anterior segment **findings**. L.B. was initially pleased with the vision and comfort offered by the lenses. She was released to wear the lenses on a daily wear schedule until we could see her the immediate morning after the first night of sleeping in the lenses. At the one-day visit, L.B. presented reporting that the vision and comfort of the lenses was great throughout the previous day and evening. The lenses were still centering a touch inferior, but they center when she blinked and fit acceptably. Vision was 20/15- OD and OS. Biomicroscopy revealed 1+ conjunctival redness, 1+ **3** and 9 staining OU. L.B. was **free** to wear the lenses on a CW basis until the one-week visit.

At the one-week exam, L.B. again reported that she was doing great with the lenses. She had started to notice some dryness while reading at night though. Visual acuity was 20/15 OD and 20/20+ OS. No surface deposits were noticed and the lenses continued to center slightly inferior temporal. Grade 2+ conjunctival redness **and 3** and 9 staining were recorded. Some concern was building on our part, but L.B. was still very comfortable in the lenses and motivated to continue the study with the current fit. We released her until her 1-month visit with the condition that she was to report an increased redness or discomfort immediately.

L.B. was still very happy with the **Menicon** lenses at her one-month visit. She was seeing 20/15- with each eye. The fitting relationship remained unchanged and some 1-2+ surface deposits were noted OU. Biomicroscopy slightly reduced conjunctival redness and **3** and 9 staining, as well as 1+ meibomian gland capping. Due to the importance of adequate tear film for **successful** CW, a lid hygiene regimen was started to address the glands. She was to remove the lenses once weekly for cleaning to help prevent **further** surface deposition. At the final study visit, L.B. reported that she had been compliant with the lid scrub and lens-cleaning regimen. Only mild deposits were recorded at this visit and conjunctival redness had decreased to a grade of 1+ OU. The **3** and 9 staining was 1-2+. L.B. was very pleased with continuous wear of the lenses and was excited to be released **from** the study with the go ahead of continuing her current schedule. When contacted one month post-study, L.B. reported that she was still doing great with the lenses and removed them about once a week to clean and disinfect them overnight.

Subject 9:

T.C. entered the study as a 20-year-old Asian female undergraduate student. She had been wearing GP lenses for the past 6-7 years for an average of 14 hours per day. She described her vision as "**fine**" with the current lenses and had a feeling that the right eye needed a different powered lens for proper correction. Ocular history was significant for a corneal abrasion, but no direct complications contributed to the lenses were noted.

Habitual GP parameters and entering acuities:

OD: 7.60/9.2/-3.75 20/30-

OS: 7.60/9.2/-4.00 20/15-

The lenses were decentered slightly temporal OU with some excess clearance inferiorly. The lenses were lid-attached and had good overall movement. The fit was recorded as acceptable. Biomicroscopy revealed grade 1-2+ inferior corneal staining OU. During the fitting process, the 9.6 diameter of the **Menicon Z** fitting set was too large for her small corneas.

**Menicon Z Aspheric Lenses Ordered:**

OD: 7.6519.01-4.25

OS: 7.7019.01-3.00

The new powers and parameters were immediately comfortable for T.C. and her visual acuity was 20/15 with each eye alone. The lenses were lid-attached and centered well. Slit lamp examination showed 1+ conjunctival redness OU, 2+ inferior SPK and 3 and 9 staining OS, and 1+ 3 and 9 staining OD. At the end of the dispense visit, T.S. expressed initial excitement about her new lenses, but was somewhat hesitant about sleeping in them. The following morning, T.C. reported that her eyelids felt sticky and that she needed to use a lot of rewetting drops until things felt normal. Vision was satisfactory though and the lenses felt **fine after** an hour or so. Visual acuity was still 20/15 with each eye and the lenses fit was recorded as acceptable. 1+ conjunctival redness was recorded, as well as 2+ inferior SPK in combination with traditional 3 and 9 staining. T.C. was released until her 1-week follow-up.

At the one-week visit, T.C. expressed some concerns about the dryness she felt in the evening and overall discomfort of the lenses. She was only able to wear the lenses for 4 continuous days before she felt she needed a break **from** them. Mild front surface deposits were noticed, but the lenses still appeared to be an acceptable fit. Biomicroscopy revealed 1+ conjunctival and limbal redness, with 1-2+ inferior SPK OU. The study investigators reassured her that the lens-to-cornea fitting relationship was proper and that her corneal health was not showing increased signs of concern. She was released until her one-month visit with instructions to attempt CW as long as she felt comfortable with it. Upon returning for her one-month follow-up, T.C. reported that she had been wearing the lenses on a strictly DW basis for the past two weeks. The main reason stated on why she chose to discontinue CW was that the lenses were too dry at night when she was studying. She was released **from** the study at this point and elected to continue wearing the lenses on a DW basis.

Subject 10:

C.B. presented as a 34 year old Asian female with a high degree of myopia. Review of her previous ocular history revealed many complicated retinal problems that reduced her best-corrected visual acuity to 20/30+ with each eye. Her systemic history was

significant for severe hay fever. Anterior segment examination revealed 3+ pinguecula nasal and temporal OU that were starting to encroach on the limbus. Her current small diameter lenses would bump up against them occasionally, but she didn't report any discomfort or complications. Study investigators expressed initial reservations about including C.B. in the study, but she was in desperate need of new GP lenses and the study was still recruiting for its tenth subject.

C.B. had been a GP wearer for about 16 years before entering the study. An average 16-hour wear time was reported as well as occasional sleeping in the lenses. She noted her vision as "pretty good" with her only concern being excess debris getting into her eyes while working outdoors at her family tree business.

Her most recent contact lens prescription revealed the following parameters in a Boston II material:

OD: 6.919.01-19.00

OS: 7.3/9.0/-13.00

C.B. reported that the right lens that she was currently wearing was most likely an older lens than what the prescription indicated.

Biornicroscopy at this visit revealed 2+ conjunctival redness, 1+ limbal redness, and 1-2+ combination of SPK and 3 and 9 staining. VA's were recorded at 20/30- OD and 20/25- OS. Habitual fit examination revealed less than ideal conditions. The OD lens was decentered ST, had excess apical clearance, and slammed straight down on every 3<sup>rd</sup>-4<sup>th</sup> blink. The OS lens was decentered ST also and had slight apical touch. The Menicon Z fitting set used by investigators did not have adequate parameters to conduct an appropriate trial fitting on C.B., so lenses were ordered empirically in the Menicon Z Alpha I design. After several modifications to the OD lens base curve, the following parameters were settled on:

OD: 7.1519.01-18.25

OS: 7.3019.01-13.00

Both lenses yielded less than ideal fits, but they were lid-attached and moved well with blink. Vision was 20/30 with each eye. The patient was released to wear the lenses on a DW basis until she was able to return for two consecutive days for the first night of CW. Several attempts were made to schedule further visits, but the patient was lost to follow-up at this point.

## Discussion and Conclusion

Many patients are longing for continually corrected vision with minimal maintenance and complications associated with its benefits. With the arrival of hyper-Dk lens materials, extended/continuous wear contact lenses seem to be the answer to fulfill some of these patients' needs. We were very pleased with how the Menicon Z lenses performed for the majority of our patients. We must note, that we are novice practitioners with little gas

permeable fitting experience and thus an experienced clinician may have greater success **transitioning** daily wearers into this modality.

Most of our patients had little trouble adapting to the new material and wearing schedule. As mentioned above, some complications arose including the one case of adherence. Some patients had a difficult time adapting to the concept of sleeping in the lenses. These patients also happened to be college students who made a habit of late-night studying which lead to subjective dryness as the day grew longer. However, the motivated subjects recruited for the study loved the **freedom** of having continually corrected vision and found no **difficulty** wearing the lenses while they slept or upon awakening.

Our observations made throughout the study may help practitioners discern whom they would consider suitable candidates for continuous wear. Of our subjects, those that were very motivated to wear gas permeable lenses on a continuous wear schedule did very well with the modality. They commented at every visit that they loved not having to remove and clean their lenses every day. They found it much less of a hassle as compared with their daily wear lenses. They also found it reassuring that they did not have to worry about placing their ocular health at risk if they slept in their lenses. On the other hand, patients that are only moderately interested in continuous wear may not totally appreciate the benefits it can offer them. They subjectively found wearing the lenses slightly uncomfortable while they slept and did not adapt to the wearing schedule as readily as the highly motivated.

As mentioned previously, we surveyed our subjects' opinions on the modality at the start and finish of the project. At the commencement of the study, the participant's opinion of continuous wear lenses was very favorable. When asked how satisfied the subjects were with the modality, most all gave the modality extremely high ratings. Only one participant said they were not satisfied with wearing the lenses on a continuous basis. When asked if this modality was a viable alternative to LASIK, all participants felt it was a viable alternative to surgical correction.

One month after the completion of the study, we **emailed** the participants to see again get some feedback on the **Menicon Z** lenses. Of the **8** subjects that completed the study, all still wore the lenses occasionally or on a daily wear basis. Four participants wore them on a continuous wear schedule, but not always the **full** thirty days.

Overall, we feel the **Menicon Z** lenses are an excellent option to offer patients seeking an increased wearing schedule with a gas permeable lens. Not only is **Menicon Z** the sole gas permeable lens with FDA approval to be worn on a continuous wear basis, they are also available in a wide enough range of specifications to meet almost any patient's needs.

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