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A CLINICAL EVALUATION OF THE CIBA TORIC AND HYDRON TORIC SOFT CONTACT LENSES

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ABSTRACT

Two currently available brands of soft toric contact lenses were evaluated in a clinical setting. The study was designed to assess the overall effectiveness of the Ciba TORISOFT and the American Hydton soft toric contact lens. Each lens was judged, based on manufacturer quality control, visual acuity, how well the eye physiology adapts to the lens, how comfortable the lens is, and the durability of the lens. The Hydron Toric and the Torisoft lenses both utilize front surface toricity. The Hydron lens makes use of a prism ballast and inferior truncation for stability, while the Torisoft incorporates thin zones at 90^{o} and 270^{o} and no truncation to orient the lens properly. The American Hydron is constructed with an aspheric back surface in an attempt to conform to the topography of the cornea and immediately surrounding sclera. The Torisoft makes use of a spherical back surface. At the writting of this paper patients in the study have been wearing the lenses anywhere from two weeks to three months. Presently 91% of the twenty lenses initially fit are still being worn. Further data on these lenses is forthcoming in Part II of this study. Initially both lenses have shown a high level of success in all areas of investigation.

PREFACE

This paper represents preliminary results of a continuing study of short and long term effects and effectiveness of toric hydrogel lens wear. Part II of this study will present further data on both lens designs and will include long term evaluations of physiological, refractive, and physical changes occuring after wearing periods of one year or more.

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INTRODUCTION

The term "soft" lenses has evoled through popular usage and refers to contact lenses that are fabricated from plastics that contain water in concentrations exceeding 25%. Other terms such as hydrogel and hydrophilic are sometimes used to describe this type of contact lens and owe their derivation to the water-binding property of the material that results in flexibility and resiliency of the lens.[6] Since the introduction of soft contact lenses to the eye care field, the demand has grown steadily. Past experience has indicated that it is difficult to fit a patient with spherical soft lenses if the cylinder error is too great.[8] The amount of cylinder that would contra-indicate spherical soft lenses is a highly individualistic value, for some patients can tolerate .50 Diopter of residual astigmatism while others can tolerate a full 1.00 Diopter of uncorrected astigmatism.[8] A general rule to follow is that if the residual astigmatism is greater than .75 Diopter, spherical soft contact lenses are contra-indicated.[8]

It has been estimated that between 25% and 32% of the general population has significant (greater than 0.75 D) astigmatism.[17] At present many soft toric lenses and their respective fitting procedures are available to the eye care practitioner. Successful fittings have been steadily climbing and it is not unusual to find 80% success rates in the literature.[4] Ewell states that many astigmats have better visual acuity through soft toric lenses than through rigid lenses or spectacles.[7]

The trend in soft lens design has been in the direction of thinner and more flexible construction to increase both comfort and oxygen transmissibility. These thinner lenses also conform more closely to the cornea and any toricity theron will be transferred through the lens. About 85% to 100% of corneal toricity is transferred through most hydrophilic materials with 30% or greater water content.[3] It becomes obvious that since most of the corneal toricity is transferred through the lens, either front surface or back surface cylinder must be incorporated into the lens to correct the astigmatic error. Another major problem is the need to keep the lens oriented in the correct alignment and prevent rotation. Even though soft lenses rotate much less on the eye than do rigid lenses they still have a tendency to rotate. A small amount of rotation combined with a high cylindrical refractive error may result in an intolerable fit.

The tendency of soft lenses to rotate is attributed mainly to the interaction with the lids, primarily the upper lid.[17,18] Rotation may also be a function of the looseness of the bulbar conjunctiva,[13,17] and the rigidity of the lens material. Holden describes several factors affecting lens rotation and orientation including location, tightness, symmetry and dynamics of the lids.[18]

For a highly toric cornea, the introductions of a combination of front and back toric surfaces is usually not sufficient to adequately orientate the lens. Other means utilized to orientate the lens are: prism ballast, single and double truncations, X-shaped friction marks, vertical alignment grooves or thinning the top and bottom portions of the lens.[19,15,20] Tightness of fitting and centration both appear to be important factors in reducing rotation of the lens.[13] Slabbing off the superior and inferior edges of the lens will tend to stabilize rotation via the reduction in lid interaction. Inferior prism ballast creates a weight differential with increased inferior weight stabilizing the lens. Tomlinson found that a combination of 0.75 D of prism and a 0.5 mm inferior truncation gave acceptable results and that neither increased truncation or increased prism ballast resulted in significant improvement.[19] Currently the design of single truncation combined with prism ballast is preferable for axis orientation and stabilization in soft toric contact lenses. Double truncation designs appear to show more rotation than do the single truncation designs. Patients with high amounts of with the rule astigmatism appear to be fit more successfully with a round, prism ballast soft contact lens.[12]

The lenses that are the concern of this research project are the Hydron toric and Ciba Torisoft contact lenses.

The American Hydron Toric hydrophilic contact lens is composed of Polymacon. The lens is swollen to equilibrium state with 0.9% sodium chloride solution. The Polymacon material has a refractive index of 1.43 and the lens has a visible light transmittance greater than 97%. It has a continuous aspheric posterior surface with a progressive flattening towards the edge, and the anterior surface is toric with prism ballast and truncation. The posterior surface is one aspheric curve (eccentricity value = 0.7) combining with a central optic radius to give scleral contour which allows the lens maximum alignment. The anterior periphery is tapered on the minus lenses to provide for minimal edge thickness without sacrificing edge strength. Table 1 lists the available parameters of the Hydron Toric contact lens.

The Ciba Torisoft contact lens is a front surface toric and is stabilized via two slab off thin zones, one superior and one inferior that are in contact with the eye lids. The Torisoft lens is composed of a hydrophilic ploymer of Hydroxyethylmethacrylate (HEMA) called Tefilcon. The lens is swollen to equilibrium state by a 0.9% sodium chloride solution. The material has a refractive index of 1.43 with a visible light transmittance greater than 98%. The back surface is spherical with a large posterior optic zone.

TABLE 1: Manufacturer's Lens Specifications

Lens Name	Manufacturer	Hydration	Diameters	Base Curve
Hydron Toric	American Hydron Div. of Nat'l. Pat. Devp. Corp. Woodbury, N.Y.	30.6%	13.5 14.0 14.5	7.7-8.9 in .2mm steps
Torisoft	Ciba-Geigy Corp. Atlanta, Georgia	37.5%	14.5	8.6 8.9 9.2

Lens Name	Sphere Pwr Range	Cyl Pwr Range	Axis	Prism	Center Thickness
Hydron Toric	+20 D to -20 D (.25D steps)	-.50 to -6.00 (.25D steps)	0 to 180	1PD	.18mm
Torisoft	Pl to -6.00 D (.25D steps)	-1.00 & -1.75	10 20 80 90 100 170 180	none	.095 @ -3.00 D

There are still many problems that can result from soft contact lens wear. Arc line abrasions located near the superior limbus with associated limbal vessel engorgement are found (with lathe cut lenses) mostly in orientals and other individuals with tight or low positioning upper lids.[11] One of the most common findings is vertical striae which indicate a fairly long standing edema.[16] The edema results from oxygen deprivation to the cornea which is a function of lens movement and most importantly, lens thickness. Other researchers have shown relationships of base curve used,[14] lens diameter,[2] and prism ballast used.[18] Further corneal changes include endothelial blebs,[10] arcuate staining, and physiological staining. Dedonato reported limbal injection and leukocyte infiltration preceding corneal vascularization due to less oxygen transmission to the cornea.[5]

Optical performance of the lenses can be adversely affected by coating and deposits found on the lenses such as: mucopolysaccharides, mucin, proteins, calcium, urea, mercurial deposits, pigment deposits, and fungal and bacterial organisms.

METHODS

Patients from the clinic population of Pacific University College of Optometry, student recruits, and the general public were screened for the appropriate characteristics. Requirements of potential candidates included: (1) Normal tear break-up time with no tear insufficency, (2) no evidence of ocular or adenxial abnormalaties or infections, (3) a clear cornea with no apparent contra-indications for normal soft lens wear, (4) manifested residual astigmatism of 0.75 D or more with any spherical soft lens, or reduced visual acuity of at least two lines when comparing spherical soft lenses to spectacles.

There was no limitations as to patient age, sex, or occupation, providing they meet the above criteria. All candidates were required to have a routine analytical eye exam previous to the contact lens work-up. If any contra-indications occured during the course of the evaluation, the patient was removed from the project. Previous contact lens wearers were accepted only if their refraction had stabilized after discontinuation of the contact lens wear.

Lens assessments were performed upon dispensing, one week after dispensing, after one, three , and six months of wear, as directed by the manufacturer. Assessments included: physical fit as determined by retinoscopic reflex, centering, acuity, over-refraction, comfort, wearing time, and movement (0.5 to 1.0 mm is desired in the vertical meridian without torsional movement).

Physiological response was monitored with the Electronic Digital Pachometer by Dicon for corneal edema, and with the biomicroscope for lid, corneal, limbal, and conjunctival integrity.

RESULTS

A total of eleven patients took part in this study, and of these, two had only one astigmatic eye. This comes to a total of twenty eyes that were fit. The ratio of eyes fit with one brand as opposed to the other brand was very close to one to one with nine eyes fit with the Ciba Torisoft and eleven eyes fit with the American Hydron Toric. Verification of lens parameters was attempted upon receipt of each lens. The power was determined by use of a standard wet cell called the Soft-cell and an attempt was made at base curve verifacation by means of the Soft Lens Analyzer™, by Hydrovue. The asphericity of the American Hydron made verifacation of the base curve somewhat questionable. This lack of a good, reliable method for toric soft lens base curve verification left us with observation of the fitting characteristics on each individual eye as the best objective assessement of base curve reliability. At the writting of this paper 91% of the twenty lenses initially fit were still being worn. This percentage includes 100% of the Ciba Torisoft and 82% of the American Hydron.. In all fairness it must be stated that the failures with the American Hydron were on eyes with very high degrees of astigmatic errors in which case a much higher failure rate would be expected regardless of lens conformation or construction.

In a small group of patients such as the one studied here, these percentages may or may not be significant. Again, the data may be skewed due to the Torisoft being fitted to only patients with low astigmatic refractive errors while the Hydron pool included patients with high astigmatic errors.

In both cases trial fitting was carried out with spherical trial lenses which is fine for prescribing a correction with lower powers of cylindrical error. With higher cylinder powers the fit would be more accurately assessed by means of a diagnostic lens incorporating cylinder correction near the desired lens for that individual eye. In that case a spherical trial lens would still be needed to determine the proper lens power. In addition diagnostic lenses more than 2.00 D from the final prescribed power tend to yield increasingly less diagnostic information relative to the physical fit of the ordered lens.

Eight of the eyes had against-the-rule astigmia, eleven had with-the-rule astigmia, and one had oblique astigmia. Fourteen eyes were myopic, the lowest spherical component being .75 Diopter and the highest being 7.50 Diopters. Six patients were hyperopes with 1.75 Diopters being the lowest error and 4.75 Diopters being the highest. Corneal curves ranged from 40.25 Diopters (lowest K) to 46.75 Diopters (highest K) and corneal toricity ranged from .37 Diopter to 3.75 Diopters.

Successful fits were achieved throughout the spectrum of physical and optical parameters, indicating that an adequate fit is possible for virtually any type of patient. At the same time it must be stated that as a patients refractive error (especially the cylindrical component) increases, he becomes increasingly harder to achieve an adequate fit.

Profiles of the subjects are listed in the tables below.

Sex		Age		K Readings (low)		Corneal Cylinder	
Male	8 (15 eyes)	Range	21-36	Range	40.25-45.50	Range	.37-3.75
Female	3 (5 eyes)	Mean	25.9	Mean	42.75	Mean	1.62

Refractive Sphere		Astigmatism Type		Refractive Cylinder	
Hyperopia		Hyperopia		Hyperopia	
Range	1.50-4.75	WTR	4	Range	.75-5.50
Mean	2.25	ATR	2	Mean	2.75
Myopia		OBL	0	Myopia	
Range	.25-7.50	Myopia		Range	.75-1.75
Mean	2.75	WTR	7	Mean	1.19
		ATR	6		
		OBL	1		

The Ciba Torisoft diagnostic lenses are in a set of six lenses. There are three base curves and two powers available in each base curve. There is no cylinder component in the diagnostic lenses. There are scribe marks on the front surface at three and nine o'clock to enable determination of the lens orientation. The diagnostic lenses available are:

Base Curve	Sphere Power	Cylinder Power	OAD
8.6	-2.00	0.00	14.5
8.9	-2.00	0.00	14.5
9.2	-2.00	0.00	14.5
8.6	-4.00	0.00	14.5
8.9	-4.00	0.00	14.5
9.2	-4.00	0.00	14.5

After a prefitting examination the fitting guide recommends that you begin with the 8.9 base curve unless the Keratometry readings are excessively steep or flat. After a 15 minute equilibrium period, evaluation of the lens is performed. If the lens is not suitable then proceed to a steeper or flatter base curve.

Criteria of a well fitted Torisoft lens includes: full corneal coverage, good centration around the cornea, movement of 0.5 mm in superior gaze with blink, lens lag of 0.5 to 1.0 mm with superior gaze, good comfort, stability with little rotation, and good acuity in the overrefraction.

A tight (steep) fitting Torisoft lens can be indicated by: bubbles under the lens, little or no movement with the blink, conjunctival indentation, blurred vision which clears immediately following the blink and the lens may decenter inferiorly.

A loose (flat) fitting Torisoft lens may: tend to decenter temporily and superiorly, have excessive movement with the blink, have lower lid sensation, have edge standoff, and unstable vision.

To determine what axis to order, the scribe marks orientation is compaired to 180°. If the scribe marks are rotating and orientating in a clockwise direction then you add the number of degrees to the overrefraction cylinder axis. If the scribe marks are rotating and orientating in a counterclockwise direction you then subtract this number of degrees from the over-refraction cylinder axis.

The American Hydron Toric diagnostic lenses used to determine the lens of choice were all truncated and had a vertical prism of one prism diopter base down. Since there are so many parameters available, more diagnostic lenses were necessary. There was no cylindrical power in these lenses. The diagnostic lenses available were:

Base Curve	OAD/OZD	Sphere Power	Prism Ballast	Truncation
8.9	13.5/12.5	-2.75	1BD	1mm
8.9	14.0/12.5	-3.00	1BD	1mm
8.9	14.0/12.5	Plano	1BD	1mm
8.9	14.5/13.0	-1.00	1BD	1mm
8.7	13.5/12.5	-1.00	1BD	1mm
8.7	14.0/12.5	-3.00	1BD	1mm
8.7	14.5/13.0	-3.50	1BD	1mm
8.7	14.5/13.0	-3.00	1BD	1mm
8.5	14.0/12.5	-3.00	1BD	1mm
8.5	14.5/13.0	-3.50	1BD	1mm
8.3	13.5/12.5	-3.00	1BD	1mm
8.3	14.0/12.5	-2.50	1BD	1mm
8.1	13.5/12.5	-2.00	1BD	1mm
8.1	14.0/12.5	-3.50	1BD	1mm
7.9	13.5/12.5	-3.50	1BD	1mm
7.9	14.0/12.5	-1.00	1BD	1mm
7.9	13.5/12.5	-1.00	1BD	1mm

American Hydron recommends that the average Keratometry reading be taken and then go .4mm to .5mm flatter. The fitting guide suggests choosing an overall lens diameter of 2 to 2.5mm larger than the longest iris diameter. After allowing the lens to equilibrate for fifteen minutes, evaluation fo fit can proceed.

A well fit American Hydron Toric should have the following characteristics: The truncation should be very close to parallel to the lower lid margin with rotation minimal, a lens lag of 1.0mm in superior gaze, 1.0mm or less vertical movement on the blink, good centration after decentering, and good comfort and acuity. If the lens rotates excessively a steeper lens should be considered.

The cylinder axis is calculated similarly to the Ciba Torisoft, however the truncation is utilized instead of the scribe marks as with the Torisoft.

The Ciba Torisoft is a stock order lens and generally required a one to two week delivery time. The lenses always arrived in groups as ordered. The American Hydron Toric lenses required a delivery time of five to six weeks and arrived seperately for each patient even though they were ordered in groups of patients.

Verification of sphere and cylinder power was measured with a lensometer and soft cell by positioning the American Hydron lens with the truncation as a base and using the markings on the Torisoft to get the readings. The base curve was evaluated with the Soft Lens Analyzer™ by Hydrovue, but findings were inconclusive in part due to the aspheric nature of the posterior surface in the Hydron lens. The Torisoft base curve was easier to evaluate due to its spherical back surface. All of the lenses were accepted as being within the tolerances of what was ordered.

At dispensing, eighteen of the twenty lenses ordered centered well. The two lenses that did not center well decentered inferiorly and were not dispensed. The patient was A.Z., who had a refractive error of +2.25 -3.75 x 103 OD and +5.00 -5.50 x 075 OS. The trial lens that was used to assess the fit showed good centration and acceptable rotation with the blink. The main problem with this fit can be attributed to the fact that the diagnostic lens was a -3.00 Diopter sphere, which made it 5.25 Diopters away from the power ordered for the right eye and a full 8.00 Diopters away from the power ordered in the left eye. Generally, to arrive at a good physical fit, the diagnostic lens should be no more than two diopters away from the final power ordered. Incorporation of cylinder in a diagnostic lens (again near the power and axis to be ordered) would yield even more diagnostic information relative to the fit of the lens ordered. These two lenses were ordered with this knowledge and it was known that re-ordering was very probable. The first ordered lens would be used as a diagnostic lens in this case. Unfortunately the patient decided to drop out of the study when the first lens came back and did not yield an adequate fit. The patient was unwilling to put in the extra time necessary to arrive at an adequate fit.

Only nine of the eleven lenses ordered were used for calculation of the optimum base curve relative to Keratometry readings. This is because A.Z. was never fit adequately and therefore should not be included in computation of an optimum base curve. This optimum base curve differed from the manufacturer's suggested fitting procedure. Computation indicates that the lenses dispensed were on the average, 0.86mm flatter than the average Keratometry reading.

Ciba recommends using an 8.9mm base curve as the first lens of choice for diagnostic purposes unless Keratometry readings reveal an extremely steep or extremely flat cornea. A comparison of Keratometry readings to the base curve finally ordered, shows no definite pattern, not even a vague trend. From our data we can only conclude that the central 3.0mm of the cornea lend very little diagnostic information relative to the fit of a Ciba Torisoft. This is understandable since the fit is determined in the most part by the peripheral cornea and immediately surrounding sclera. Since very little information can be gleaned from Keratometry readings, the fitter might as well start with the 8.9mm base curve, since it is in the middle and then you only have one step to go in either direction.

The next area of importance when dealing with physical fit is lens

lens rotation. At dispensing eighteen of the twenty lenses ordered oriented just as the diagnostic lens indicated they would, but some increase in rotation was noted with the blink as compaired with the diagnostic lens. Lid interaction with the front surface toricity of the lens, combined with the weight differential due to the spherical component maybe responsible for increased lens rotation. Even with this increase in rotation, the amount was minimal enough not to interfere with adequate acuity in all lenses that were dispensed.

Both manufacturer's designs to maintain lens orientation seem adequate with the American Hydron Toric yielding a slightly more stable orientation.

A good indicator for predicting a satisfied soft toric contact lens wearer is the JCC test. If the patient is not very critical of axis positioning (say within 5°) this patient will be able to tolerate a soft toric lens quite well. A very critical response of the JCC test of one or two degrees, despite the amount of cylinder power, may indicate that the patient will be difficult to satisfy in achieving best visual acuity with soft toric lenses.

The Ciba Torisoft produced excellent visual acuities in most cases. There were several complaints of intermittent blur that would resolve with a few good blinks. This was due to the lens occasionally tending to rotate eight to ten degrees for short periods of time. The contact lens cylinder power prescribed was quite similar to the spectacle prescription. The Torisoft lenses seem to be able to mask only about .25 Diopter of cylinder while the Hydron masked only slightly more. Four eyes indicated .50 Diopter more cylinder was required for best visual acuity and six eyes indicated a need for .25 Diopter more of cylinder. No eyes were over minused with cylinder power and this was expected since a conscious effort was made to prevent over-correction of cylinder.

The American Hydron Toric lens provided visual acuity better than the spectacle prescription in 37% of the cases. The acuity was equal to the spectacle prescription acuity in 45% of the cases. In 18% of the cases the acuity was unstable, although good vision was attained when the lenses oriented properly. The 1 prism diopter didn't create any discomfort and in one case where a monocular fit with the toric Hydron lens was required it actually reduced an existing vertical imbalance. The American Hydron Toric lens will mask about .50 Diopter of corneal cylinder or less. If more cylinder is masked the lens is probably too tight and showing little or no movement.

Base line data was collected on all patients with the Dicon digital pachometer on corneal thickness. Follow up examinations always included biomicroscopy, keratometry, refraction, over-refraction, fluorscein staining, and pachometry. Pachometry was not always possible due to numerous computer malfunctions and therefore this data was incomplete and inconclusive.* The data that was obtained indicated a moderate amount of corneal edema was present above base line data, but not to a clinically significant level. Keratometry findings showed little or no change over time and in all cases were always crisp and clear in mire representation. Slit lamp evaluation for corneal edema using split limbal illumination was negative throughout the course of lens wear in all patients. The only physiological change that was noted in any of the patients was in T.J. and fluorscein demonstrated central punctate staining in both eyes. With further investigation it was found that the patient had just been swimming in the local swimming pool. Observation carried out the following day revealed complete resolution of the problem.

Overall, no major problems were noted physiologically with either

*Pachometry data to be found in Appendix B lens over the short period of time we had to observe the patients. Long term data is still not available on any of the subjects and close follow up care is still required.

The comfort of both the Torisoft and the American Hydron Toric is good provided the lenses fit well. The American Hydron Toric may create a slight lower lid sensation in instances where the truncation is resting on the lower lid. The only discomfort voiced by several patients was eliminated by switching from preserved saline to the unpreserved saline.

Wearing time was initiated at three hours on day one plus one hour every day up to eight hours of wear. No problems were encountered in achieving full time wear with either lens type.

DISCUSSION

At present many brands of soft toric contact lenses are available to the eye care practitioner. The two lenses we have chosen, represent different ends of the spectrum in terms of cost, parameters available, delivery time, and lens construction. The Ciba Torisoft is a stock lens and therefore delivery time is short, price is competitive, but parameters are limited. The American Hydron Toric on the other hand is a custom made lens which leads to increased cost, increased delivery time, but offers a much wider range of parameters (both in terms of powers available and fitting specifications. In general the vast majority of astigmats demonstrate a cylindrical error of 2.00 Diopters or less and tend to fall within ten to fifteen degrees of the principle meridians.[21] these people fall within the power and axis orientation ranges of the Torisoft lens, allowing a high percentage of the population to be fit.

Another point to be considered is the fact that the Torisoft is not available in plus powers and thus does not allow one to fit the hyperopic portion of the population. The American Hydron Toric is not limited in these respects and since it is a custom lens it can be made to fit almost any patient. Both lenses were found to orient at the desired axis and showed acceptable degrees of rotation with the blink. A well fit American Hydron Toric lens demonstrates a more stable fit, relative to orientation of axis and rotation with the blink. This, we felt, is most likely due to the inferior truncation coming in contact with the lower lid in the American Hydron Toric (AHT).

Correction with the Torisoft lens results in better acuity, in general, than could be achieved with the AHT. It also should be noted, as stated before, that the AHT lens costs considerably more than the Torisoft and delivery time is at least twice as long with the AHT as with the Torisoft.

The Torisoft lens is a lens to be used on the majority of your fitting and the AHT lens should be used for your problem cases: high cylinder powers, hyperopic fits, and oblique axis fits. Both lenses give you stability, good acuity, and adequate biocompatibility when fit properly.

Soft toric lenses in general require much more time and effort to fit than do spherical soft lenses or conventional rigid lenses. The incorporation of a cylindrical component into a soft contact lens leads to difficulties in terms of arriving at a good optical and physical fit.

Soft toric lenses require a much more stable fit than do spherical soft lenses. Any lens rotation greater than five degrees with the blink will render a fit unacceptible in terms of the stability of acuity. Spherical soft lenses are fit with the flattest base curve that allows good acuity and centration. This is not the case with toric soft lenses. We must make a compromise between the flattest acceptible fit and a fit that allows the least amount of rotation. Less rotation with the blink can be achieved in two ways: decreasing the base curve or increasing the over all diameter. All of these considerations result in an increase in fitting time. This increase in time is also due to the need for two different types of diagnostic lenses. Spherical lenses are used to determine the refractive power of the ordered lens. These lenses can also be used to assess optimal physical fit, but a much greater level of success can be achieved by means of incorporating a cylindrical component into the diagnostic lens to assess the best fit, as described previously.

In the past patients with excessive amounts of cylinder in their prescription could not be fit successfully with soft lenses. The only alternative in terms of contact lens wear was a rigid lens. These two lenses provide a very good alternative to rigid lens wear. Success in wearing soft toric lenses is quite dependent on careful patient screening as well as the practitioner communicating the minor difficulties associated with soft toric lens wear. Some of the minor difficulties include: possible minor acuity fluctuations, the need for close and continued supervision of lens fit and ocular health, and all the other things that are common with any soft contact lens wear. In addition the patient should be motivated, have good hygiene, good manual dexterity, and the ability to tolerate a cylinder reorientation of five degrees.

In conclusion we feel the toric soft lens is a viable alternative for the astigmatic patient in lieu of spectacles or rigid lenses. They yield good acuity, good biocompatibility, but patience is a prerequisite and good follow up care is essential.

APPENDIX

PATIENT		DISPENSED BC	TOTAL TIME WORN LENS	LENS ORDERED	LENS BRAND	OAD
JW	OD	9.2mm	2 wks	-6.00-1.00x010	C	14.5
	OS	8.9mm		-6.00-1.00x180	C	14.5
TJ	OS	8.9mm	10 wks	-1.00-1.75x038	AHT	14.5
AZ	OD	8.7mm	no time	+2.25-3.75x103	AHT	14.0
	OS	8.7mm		+5.00-5.50x075	AHT	14.0
DS	OD	8.5mm	6 wks	+1.50-3.75x180	AHT	14.0
	OS	8.7mm		+1.50-1.75x177	AHT	14.5
EF	OD	8.6mm	6 wks	-1.00-1.00x083	C	14.5
	OS	8.6mm		-1.00-1.00x087	C	14.5
DT	OD	9.2mm	8 wks	-2.75-1.00x165	C	14.5
	OS	9.2mm		-1.00-1.00x013	C	14.5
CD	OD	8.5mm	9 wks	-1.50-1.50x113	AHT	14.5
	OS	8.5mm		-1.25-1.50x055	AHT	14.5
SM	OD	8.5mm	6 wks	+1.00-0.75x007	AHT	14.0
	OS	8.7mm		+1.75-0.75x180	AHT	14.0
HW	OD	9.2mm	2 wks	-4.75-1.00x160	C	14.5
	OS	9.2mm		-4.25-1.00x180	C	14.5
ST	OS	8.9mm	2 wks	-0.25-1.00x090	C	14.5
NR	OD	8.9mm	10 wks	-1.75-1.00x175	AHT	14.5
	OS	8.9mm		-1.75-1.00x170	AHT	14.5

PATIENT	AGE	SEX	EYE	K's	CORN CYL		SPEC R	REFR CYL
JW	36	M	OD	44.12@172/46.00@082	1.87	WTR	-7.50-1.00x180	ATR
			OS	43.62@178/45.12@088	1.50	WTR	-7.25-1.25x006	ATR
TJ	27	M	OD	41.25@180/41.37@090	0.12	WTR	-3.00-0.50x070	ATR
			OS	42.25@014/43.12@104	0.87	WTR	-1.50-1.75x020	WTR
AZ	21	F	OD	46.12@015/43.25@105	2.87	ATR	+2.00-3.75x104	ATR
			OS	46.75@164/43.12@074	3.62	ATR	+4.75-5.50x075	ATR
DS	26	M	OD	42.75@006/46.50@096	3.75	WTR	+1.75-3.75x005	WTR
			OS	43.12@180/45.50@090	2.37	WTR	+1.50-2.00x180	WTR
EF	25	M	OD	44.25@180/43.75@090	0.50	ATR	-1.00-1.00x090	ATR
			OS	44.75@180/43.87@090	0.87	ATR	-1.00-1.00x080	ATR
DT	30	M	OD	40.37@175/42.12@085	1.75	WTR	-2.75-1.23x180	WTR
			OS	40.25@175/41.75@085	1.50	WTR	-0.75-1.25x180	WTR
CD	23	M	OD	42.87@156/43.25@066	0.37	WTR	-1.25-1.25x112	ATR
			OS	42.62@020/43.37@110	0.75	WTR	-1.50-1.25x060	OBL
SM	21	M	OD	43.62@180/45.25@090	1.62	WTR	+1.75-0.75x180	WTR
			OS	43.25@175/45.00@085	1.75	WTR	+1.75-1.00x170	WTR
HW	26	M	OD	43.00@173/44.87@083	1.87	WTR	-5.25-1.25x005	WTR
			OS	43.12@167/44.87@077	1.75	WTR	-5.25-1.50x005	WTR
ST	25	F	OS	45.50@180/46.00@090	0.50	WTR	-0.25-0.75x075	ATR
NR	25	F	OD	40.50@180/41.75@090	1.25	WTR	-1.75-1.00x170	WTR
			OS	40.50@180/42.25@090	1.75	WTR	-1.75-1.25x020	WTR

APPENDIX B

PACHOMETRY READINGS

PATIENT		BASELINE	3 DAYS	1 WEEK	2WEEKS	1 MONTH	
JW	OD	A. 0.535 B. 0.523 C. 0.542	A. 0.552 B. 0.530 C. 0.550	inoperable " "	A. 0.521 B. 0.512 C. 0.536	not available " "	
	OS	A. 0.531 B. 0.512 C. 0.544	A. 0.558 B. 0.532 C. 0.560	" " "	A. 0.521 B. 0.510 C. 0.537	" " "	
TJ	OS	A. 0.556 B. 0.523 C. 0.550	A. 0.568 B. 0.533 C. 0.558	A. 0.556 B. 0.512 C. 0.562	inoperable " "	A. 0.590 B. 0.562 C. 0.581	(at one month TJ had been swimming just before test)
DS	OD	A. 0.523 B. 0.504 C. 0.514	A.0.522 B.0.532 C.0.524	no show " "	A. 0.526 B. 0.522 C. 0.521	inoperable " "	
	OS	A. 0.521 B. 0.514 C. 0.527	A.0.542 B.0.533 C.0.538	" " "	A. 0.532 B. 0.527 C. 0.536	" " "	
EF	OD	A. 0.540 B. 0.532 C. 0.534	A. 0.552 B. 0.537 C. 0.542	inoperable " "	A. 0.556 B. 0.542 C. 0.547	A. 0.550 B. 0.540 C. 0.552	
	OS	A. 0.560 B. 0.558 C. 0.573	A. 0.568 B. 0.563 C. 0.560	" " "	A. 0.572 B. 0.550 C. 0.567	A. 0.552 B. 0.543 C. 0.563	
DT	OD	A. 0.561 B. 0.543 C. 0.554	A. 0.555 B. 0.546 C. 0.547	A. 0.561 B. 0.551 C. 0.567	no show " "	inoperable " "	
	OS	A. 0.563 B. 0.532 C. 0.547	A. 0.557 B. 0.541 C. 0.552	A. 0.553 B. 0.546 C. 0.559	" " "	" " "	
CD	OD	A. 0.544 B. 0.541 C. 0.552	A. 0.570 B. 0.567 C. 0.562	A. 0.563 B. 0.561 C. 0.572	A. 0.553 B. 0.558 C. 0.560	inoperable " "	
	OS	A. 0.562 B. 0.552 C. 0.573	A. 0.571 B. 0.563 C.0.572	A. 0.560 B. 0.546 C. 0.551	A. 0.562 B. 0.552 C. 0.569	" " "	
SM	OD	A. 0.573 B. 0.562 C. 0.573	inoperable " "	A. 0.567 B. 0.560 C. 0.569	inoperable " "	A. 0.552 B. 0.548 C. 0.564	

APPENDIX B
CONTINUED

PATIENT		BASELINE	3 DAYS	1 WEEK	2 WEEKS	1 MONTH
SM	OS	A. 0.574	inoperable	A. 0.581	inoperable	A. 0.572
		B. 0.571	"	B. 0.569	"	B. 0.559
		C. 0.582	"	C. 0.581	"	C. 0.562
HW	OD	A. 0.539	inoperable	A. 0.550	inoperable	not available
		B. 0.527	"	B. 0.541	"	"
		C. 0.529	"	C. 0.532	"	"
	OS	A. 0.541	"	A. 0.562	"	"
		B. 0.531	"	B. 0.533	"	"
		C. 0.538	"	C. 0.558	"	"
ST	OS	A. 0.536	inoperable	A. 0.546	inoperable	not available
		B. 0.522	"	B. 0.537	"	"
		C. 0.541	"	C. 0.551	"	"
NR	OD	A. 0.523	A. 0.552	A. 0.547	inoperable	inoperable
		B. 0.517	B. 0.533	B. 0.541	"	"
		C. 0.537	C. 0.558	C. 0.556	"	"
	OS	A. 0.543	A. 0.567	A. 0.541	"	"
		B. 0.536	B. 0.559	B. 0.547	"	"
		C. 0.548	C. 0.571	C. 0.552	"	"

A = CENTER OF PUPIL
B = FIRST POINT LEFT OF CENTER (8)
C = FIRST POINT RIGHT OF CENTER(2)

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