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The effects of heat versus cold disinfection on the Wesley-Jessen Durasoft 4 Litetint soft contact lens

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Abstract

An evaluation of the Wesley-Jessen 74% water Durasoft 4 LiteTint soft contact lens was made using 18 lenses on nine subjects and two pairs of control lenses. Five subjects cold disinfected the lenses and four subjects heat disinfected the lenses using Softmate PS regimens. One pair of control lenses was disinfected with each system . The results of the study show that heat disinfection can damage these lenses. Three of five pairs of lenses that were heat disinfected showed discoloration upon completion of the study. This includes one pair of control lenses which were heated once daily for 6 months, the duration of the study. All cold disinfected lenses remained normal. Other results show problems with Durasoft 4 lenses not attributable to the type of disinfection used. These problems include: difficulty in handling and determining whether inside-out or not, discomfort and severe drying symptoms, a rapid decrease in wearing time, and a tendency to accumulate deposits rapidly. Only one subject remained in the study for the 6 month duration. All others left early due to lens discomfort. Each subject was seen on a follow-up schedule and normal clinical methods were used to evaluate symptomology, fitting characteristics, and refractive changes. The results suggest that dehydration in these high water content lenses is the primary problem leading to discomfort.

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THE EFFECTS OF HEAT VERSUS COLD DISINFECTION ON THE WESLEY-JESSEN DURASOFT 4 LITETINT SOFT CONTACT LENS

By

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BIOGRAPHIES

David J. Prosser grew up in Vermillion, South Dakota and attended the University of South Dakota for three years. He completed his B.S. degree at Pacific University and then attended the Pacific University College of Optometry. He was awarded the scholarship from the Auxiliary to the South Dakota Optometric Association and the scholarship from the Forest Grove, Oregon Lions Club. He plans to practice optometry in the Black Hills of South Dakota.

William E. McIntosh grew up in Mt. Ayr, Iowa and attended Northwest Missouri State University for three years. He attended the Pacific University College of Optometry and completed his B.S. degree while there. He plans to practice optometry in Iowa or Missouri.

ABSTRACT

An evaluation of the Wesley-Jessen 74% water Durasoft 4 LiteTint soft contact lens was made using 18 lenses on nine subjects and two pairs of control lenses. Five subjects cold disinfected the lenses and four subjects heat disinfected the lenses using Softmate PS regimens. One pair of control lenses was disinfected with each system. The results of the study show that heat disinfection can damage these lenses. Three of five pairs of lenses that were heat disinfected showed discoloration upon completion of the study. This includes one pair of control lenses which were heated once daily for 6 months, the duration of the study. All cold disinfected lenses remained normal.

Other results show problems with Durasoft 4 lenses not attributable to the type of disinfection used. These problems include: difficulty in handling and determining whether inside-out or not, discomfort and severe drying symptoms, a rapid decrease in wearing time, and a tendency to accumulate deposits rapidly. Only one subject remained in the study for the 6 month duration. All others left early due to lens discomfort.

Each subject was seen on a follow-up schedule and normal clinical methods were used to evaluate symptomology, fitting characteristics, and refractive changes. The results suggest that dehydration in these high water content lenses is the primary problem leading to discomfort.

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INTRODUCTION

It is generally accepted in the optometric profession that contact lenses which contain greater than 55% water should not be heat disinfected. Also, such lenses are usually used only for extended wear due to their fragility from being thinner. Early in 1987, Wesley-Jessen came out with the lathe-cut Durasoft 4 LiteTint soft contact lens which is a 74% water content lens. It is advertised to be worn daily or extended wear and to be heat or cold disinfected. Durasoft 4 (D4) lenses come in 8.6mm and 9.0mm base curves, 14.5mm diameter, and powers from +6.00 to -8.00 D. in 0.25 D. steps. They have a light blue visibility tint incorporated. This lens, which is composed of the non-HEMA polymer, Ofilcon A, has a DK/L of 55.3 at 35°C, which is about four times greater than daily wear lenses, twice as great as other flexi-wear lenses, and double that of RGP lenses[1]. Durasoft 4 lenses contain no carboxylic or hydroxylic groups, and no methacrylic acid. Therefore, proteins are said to be less attracted to the lens surface. These lenses are also made with an improved cross-linking of polymers and have relatively high tensile strength (11.4 Kg/cm^2). This allows for the center thickness to be 0.09mm, in an attempt to provide maximum wearing comfort and durability[2]. D4 lenses are currently being promoted as a problem-solver for patients having problems with protein deposits and those experiencing edema with lower water content lenses. Patients sensitive to preservatives are said to benefit from heat disinfecting these lenses. The durability of the material and

the said fact that it doesn't dry out or coat up as quickly as the average high water content lenses are added pluses[3]. This project set out to test many of the above claims while conducting a 6 month clinical study on nine subjects. To test the hypothesis that daily heat disinfection would be harmful to the lenses, we kept track of centering, movement, coloration, and shape changes in the lenses. Subject symptomology, decreased wearing time, handling problems, and deposit build-up were also monitored and proved to be the major problem areas.

METHOD

Subjects were sought by notices asking for volunteers and by referrals. They were screened for the usual contraindications to contact lens wear including any corneal and serious conjunctival problems, any systemic disease known to affect the anterior segment or would be exaggerated by wearing contact lenses, allergy to any ingredient in the solutions used, and insufficiency of lacrimal function. Lacrimal function was tested by doing tear break-up times (TBUT). A TBUT of greater than 10 seconds and an adequate tear meniscus is said to be required for the D4 lenses to remain adequately hydrated while on the eye. All subjects had adequate lacrimal function based on these criteria. The subjects were tested for sensitivity to the Softmate PS solutions by placing two drops of saline in each eye and noting whether signs of sensitivity occurred. Softmate PS solutions are preserved with potassium sorbate. No subject had a reaction to the solutions.

Nine subjects were chosen for the study, six of which are previous soft lens wearers, and three have never worn contacts. They were arbitrarily split into two groups. One group of four heat disinfected the lenses daily and one group of five cold disinfected the lenses daily. Two pairs of control lenses were cleaned and disinfected daily, one pair for each regimen, for 6 months. These

lenses were not worn during this time and served as controls for the study in an attempt to factor out subject variability. The solutions recommended by Wesley-Jessen for use with the D4 lenses are: Softmate Daily Cleaning Solution II, Softmate PS Saline Solution, Softmate Disinfecting Solution, Softmate PS Comfort Drops, and Extenzyme enzymatic cleaner made by Allergan. The cleaning and disinfecting procedures were done exactly as recommended by the manufacturers (see Appendix A). Enzymatic cleaning was done on a per-subject basis but most did it once per week.

The study lasted 6 months but only one subject remained for the full duration. All others left the study sooner.

The initial nine subjects consisted of seven females and two males. Their ages ranged from 15 to 41, $\bar{x}$=25.6. Refractive powers ranged from -7.75 to +4.75 D.S., $\bar{x}$=-1.12 D. Astigmatism ranged from -0.25 to -0.75 D., $\bar{x}$=-0.21 D. Keratometer readings ranged from 43.00 to 46.25, $\bar{x}$=44.53.

Fitting subjects for the study began using diagnostic lenses of -2.00 power and of both base curves. Initial base curve selection was made based on Wesley-Jessen's guidelines, as noted below, using the flattest corneal meridian (K_f). If K_f is 41.50 or steeper, the 8.6mm base curve should be used and if K_f is 41.37 or flatter, the 9.0mm base curve should be used for the initial evaluation of fit. A good fit is regarded as one which allows 0.5mm to 1.0mm of movement upon a blink and 1.00mm to 1.5mm of lens lag upon superior gaze as well as good centering and constant limbal coverage. The lenses were allowed to equilibrate on the eye for 15 to 20 minutes before the over-refraction and assessment of fit. Final lens power was based on vertex corrected, spherical equivalent refraction and the over-refraction. Each subject received instruction on how to clean and disinfect the

lenses. Each regimen was taught exactly the same to the respective heat and cold subjects so that the procedures would be consistent among them.

Prior to dispensing them to the subjects, the lenses were examined for normal shape and coloration by visual inspection. Normal lens shape is considered to be a perfect bowl when resting on a finger tip in the hydrated state. Any deviation from normal, such as a tendency toward a "taco" shape or to roll up abnormally, was noted.

Upon dispensing, initial comfort, visual acuity, lens movement and centering were recorded. After 15 to 20 minutes, an over-refraction was performed and movement, centering, and comfort were again recorded. After determining the lens specifications were proper, the subject was released for daily wear and daily disinfection. The three first-time wearers were given a wearing schedule starting with 4 hours the first day and increasing one hour per day to a maximum allowable time of 16 hours. The other six subjects, who are all previous soft lens wearers, were allowed to continue with their normal schedules of full day wear with a maximum of 16 hours. Follow-up exams were scheduled at approximately 1 week, 2 weeks, 1 month, and 3 months. Subjects were also seen as needed. They were instructed to keep track of any problems and symptoms that occurred between progress visits. The testing done at follow-up visits is displayed on the progress worksheet which follows (see Appendix B).

RESULTS

The results of the study are presented in tables 1-4. Table 1 shows the physical and fitting characteristics of all nine pairs of lenses. These characteristics were noted and recorded at the dispensing visit and at the end of the study and were monitored throughout the study. A description of the amount and type of deposit build-up during the study is presented as well as the type

of disinfection and the number of times each pair was disinfected and cleaned with enzymatic cleaner.

Six of the subjects presented at follow-up visits with varying degrees of what appeared to be protein deposits. The appearance of these deposits ranged from fine, granular to generalized haze over the entire lens surface. These six subjects all reported that deposits tended to build quite rapidly on the lenses. Upon completion of the study, all lenses were enzymatically cleaned and studied and no significant permanent deposits remained. Subjects # 2, 3, and 4 did not present with significant deposits on their lenses at follow-up visits.

All of the lenses demonstrated good and adequate movement at the dispensing visit with one pair showing sluggish movement, subject #5. All 18 lenses did tighten up on the eyes, i.e., showed less movement over time indicating that they do steepen.

At the dispensing visit, all lenses centered very well and had good limbal coverage with the exception of subject # 9's right lens. This lens centered superior-temporally. By the end of the study, all lenses remained with good centration except subject # 9's right lens, which still centered superior-temporally. Subject # 6's right lens centered superior-nasally.

All lenses were of normal light blue color and were flawless prior to wear and daily disinfection. At the completion of the study, all lenses remained normally colored except subjects # 1 and 8. These lenses became grayish in color and were obviously abnormal in comparison to a lens fresh out of the vial. These two subjects used heat disinfection.

Most of the lenses maintained their original, normal shape throughout the study. Both of subject # 1's lenses were of abnormal shape. Two lenses were inadvertently torn during subject handling. One of these ripped in half and the other had a small notch on the edge.

TABLE 1: SUMMARY OF THE PHYSICAL AND FITTING CHARACTERISTICS OF DURASOFT 4 LENSES

SUBJ	REGIMEN USED/# TIMES DISINFECTED	MOVEMENT		CENTERING		DEPOSIT BUILD-UP	COLORATION		SHAPE	
		At dispense	over time	At dispense	over time		Pre-wear	Post-wear	Pre-wear	Post-wear
1	Heat/190	Good/ adequate OU	Adequate but lens steepened OU	Centers well OU	Centers well OU	Granular/lattice protein deposits OU Easily removed	Normal OU	Gray discolor OU	Unflawed OU	Abnormal OU
2	Heat/20	"	"	"	"	Insignificant deposits OU	"	Normal OU	"	Unflawed OU
3	Cold/14	"	"	"	"	Insignificant deposits OU	"	"	"	OS torn OD unflawed
4	Cold/20	"	"	"	"	Insignificant deposits OU	"	"	"	Unflawed OU
5	Cold/35	" Sluggish OU	"	"	"	Mild granular protein deposits OU Easily removed	"	"	"	"
6	Cold/24	Good/ adequate OU	"	"	OD center sup/nasal OS center well	Granular protein on upper 1/2 of lenses due to GPC Easily removed	"	"	"	"
7	Heat/35	"	"	"	Centers well OU	Mild protein deposits OU Easily removed	"	"	"	OD edge notched OS unflawed
8	Heat/40	"	"	"	"	Film over entire lens surface OU Easily removed	"	Gray discolor OU	"	Unflawed OU
9	Cold/50	"	"	OD centers sup/temp OS centers well	No change from dispense	Granular protein deposits OU Easily removed	"	Normal OU	"	"

Table 2 shows the results obtained from disinfecting the two pairs of control lenses over the 6 month period. These lenses were not worn but were cleaned and disinfected once every day and cleaned with enzymatic cleaner once every week using the exact procedures used by the subjects. The results presented in table 2 suggest that heat can be damaging to D4 lenses over time.

TABLE 2: Control lenses after 6 months of daily disinfection

Lens 1	-2.00/9.0 b.c. Cold disinfection	Normal shape and color
Lens 2	-2.00/9.0 b.c. Cold disinfection	Normal shape and color
Lens 3	-2.00/8.6 b.c. Heat disinfection	Lens has lost its normal color and shape. It has become gray, it folds excessively, and has taken on a "taco" shape. This lens is destroyed.
Lens 4	-2.00/8.6 b.c. Heat disinfection	Lens has lost its normal color and shape. It has become gray, it folds excessively, and has taken on a "taco" shape. This lens is destroyed.

Table 3 is a list of the keratometer readings of each eye of the nine subjects and the corresponding base curve of the lens which was determined to be the best fit. Based on Wesley-Jessen's fitting criteria, the 8.6mm base curve would have been indicated for every eye in the study. This was not the case. Three of the subjects required the 9.0mm base curve for a best fit even though the keratometer readings indicated the 8.6mm base curve.

TABLE 3: Keratometer readings and the corresponding base curves that were fit.

Subject	Keratometer readings	Base curve fit
1	OD 44.00/44.50 OS 44.25/44.37	8.6 8.6
2	OD 44.50 DS OS 44.50 DS	8.6 8.6
3	OD 43.75/44.25 OS 44.00/44.25	9.0 9.0
4	OD 43.00/44.00 OS 43.00/43.87	8.6 8.6
5	OD 45.75/45.87 OS 45.87/45.75	9.0 9.0
6	OD 43.75/44.00 OS 43.25/44.00	8.6 8.6
7	OD 44.75/46.25 OS 44.50/46.25	8.6 8.6
8	OD 45.75/46.00 OS 45.00/46.25	8.6 8.6
9	OD 43.50 DS OS 43.50/44.25	9.0 9.0
	$\bar{x}$=44.53	Wesley-Jessen fitting criteria: 8.6 if K_f is 41.50 or steeper 9.0 if K_f is 41.37 or flatter

Table 4 is a summary of relevant subject characteristics, signs, and symptoms. The most outstanding categories are: the number of weeks in the study, the maximum wearing times (both total and comfortable), symptomology, and the reasons for leaving the study. The results show that the three first-time wearers had the most comfortable wearing time and this time did not decrease over time. These subjects had minimal or no subjective symptomology. Subject # 1 did not demonstrate the symptomology until the end of 5 months of wear. Two of the three left the study for reasons not specifically attributable to the lenses. Subject # 2, fit with monovision, left because of problems adapting to the monovision. Subject # 3 left the study due to an unexpected move to California.

The six remaining subjects, who are all previous soft lens wearers, presented with virtually the same symptoms of irritation, dryness, burning, and redness. All had similar patterns of wearing time which began normally but quickly decreased within 2 weeks of wear. An exception is subject # 5 who could wear the lenses for only 4 to 5 hours from the start with only one half hour of this being comfortable. After 2 weeks with the Softmate regimen, subject # 5 tried his own previous cleaning and disinfecting regimen with the D4 lenses but the problems persisted. This subject reported no problems with his previous soft lenses. Five of the six left the study because they could no longer tolerate the discomfort caused by the lenses. Subject # 6 was dismissed after 4 weeks due to a progressive GPC which had led to a very uncomfortable grade 3+ response. Subject # 8 remained in the study for 5 months but only wore the lenses once or twice per week for a maximum of 4 to 5 hours during the last 3 1/2 months.

All nine subjects reported difficulty in lens handling and reported that it was very difficult to determine whether they were inside-out or not, not only by inspection but also by the feeling of the lenses on the eyes. There was no

difference in sensation. The researchers also had difficulty with this issue during slit-lamp observation.

Seven of the subjects reported better comfort and increased wearing time immediately after using the enzymatic cleaner. One subject reported more irritation and discomfort as well as decreased wearing time after the weekly enzymatic cleaning. The remaining subject reported no difference in comfort or wearing time. All subjects commented that deposits seemed to build up quickly.

Six subjects reported better comfort after the use of comfort drops. Three of these reported that the improvement was short term or that relief was minimal. The remaining three reported no relief of symptoms after comfort drops use.

Visual acuity remained unchanged throughout the study in four of the subjects. The remaining five showed variable visual acuity over time. One subject reported a "fogging over" of vision after 2 hours of wear by the end of the study. Refractive status remained unchanged for all nine subjects throughout the study. Ocular health status remained unchanged in six of the subjects. One subject progressed from mild to grade 3+ GPC over the course of 4 weeks of wear. This subject has a prior history of GPC. Another showed mild, diffuse corneal edema by the 6th week. Subject # 1 had developed grade 2+ GPC signs and symptoms by the end of the study.

TABLE 4: SUMMARY OF SUBJECT PROFILES

SUBJECTS:	1	2	3	4	5	6	7	8	9
PREVIOUS WEAR	Never	Never	Never	Soft EW	Soft DW	Soft DW	Soft DW	Soft DW	Soft DW
PREVIOUS REGIMEN	N/A	N/A	N/A	Cold	Cold	Cold	Cold	Heat and Cold	Cold
REGIMEN IN STUDY	Heat	Heat	Cold	Cold	Cold	Cold	Heat	Heat	Cold
TBUT (sec)	OD 18 sec OS 15 sec	OU 14 sec	OU 20 sec	OU 20 sec	OU 15 sec	OD 23 sec OS 21 sec	OD 15 sec OS 14 sec	OU 20 sec	OU 20 sec
OCULAR HISTORY	(-)	(-)	(-)	(-)	(-)	Mild GPC	Mild GPC	(-)	Mild GPC
MEDICAL HISTORY	Hay fever	Valium	(-)	(-)	Allergy to smoke	(-)	Anemia	(-)	(-)
TIME IN STUDY	6 mo	3 wk	2 wk	3 wk	6 wk	4 wk	5 wk	5 mo	8 wk
MAX. WEARING TIME	14-15 hr 1st mo	12 hr	8 hr	12 hr	4-5 hr 1st wk 2 hr last 5 wk	12 hr	8-9 hr	8-9 hr	12-15 hr 1st wk 4-5 hr 2nd wk on
MAX. COMFORTABLE WEARING TIME	14-15 hr 1st mo Decreased after 5 mo	12 hr	8 hr	6-8 hr 1st wk 1-2 hr 2nd & 3rd wk	1/2 hr	3-4 hr 1st 2 wk 1-2 hr last 2 wk	2-4 hr; 8-9 hr one day after enzyme	8-9 hr 3rd wk 5-6 hr 6th wk 2-3 hr 5th mo	1/2-2 hr
SYMPTOMOLOGY	After 6 wk: Vision blurry after 14 hr wear After 5 mo: Decrease in wearing time; dry, red, burning, irritated eyes after 4-5 hr wear	No problems with lenses but unable to adapt to monovision	No symptoms	Red, dry, burning eyes shortly after wear	Dry, irritated, red eyes and remain red for several hours after removal	Burning, itching, redness; Eyes itch more after lens removal; Mucous discharge upon awakening	Dry, scratchy, red eyes; They remain red for 3-4 hr after lens removal	Persistant irritation; Stinging, burning, dry, red eyes; Eyes hurt after lens removal; Vision foggy after 2 hr lens wear	Dry, irritated, red, burning eyes; persists 3-4 hr after lens removal
RELIEF WITH COMFORT DROPS	Yes	Yes	Yes	Yes for short time	None	None	Minimal	Yes for 1/2 hr	None, saline is better
COMFORT AFTER ENZYME	Better	No difference	Better	Better	Better	More irritation	Better	Better	Better
VISION AND REFRACTIVE CHANGES	Stable visual acuity and refraction over time	Stable	Stable	Stable	Variable acuity Refraction stable	Variable acuity and over-refractions	Stable	Stable	Variable acuity Refraction stable
OCULAR HEALTH CHANGES	Developed grade 2+ GPC	None	None	None	Mild corneal edema by wk 6	From mild to grade 3+ GPC	None	None	None
REASON FOR LEAVING STUDY	Completed study	Monovision adaptation	Subject moved	Lens Discomfort	Lens Discomfort	Dismissed due to GPC	Lens Discomfort	Lens Discomfort	Lens Discomfort

DISCUSSION

The results of this study indicate that heat disinfection can damage the Durasoft 4 lens over time. This is shown by lens discoloration in two of the four subjects who used heat in the study. Also, under much more controlled conditions, the heat disinfected control lenses showed extensive discoloration which can be attributed only to the type of disinfection used.

Since the symptomology is so consistent among the subjects regardless of the type of disinfection used, and the fact that comfort drops increased comfort in six of the subjects but only for a short period of time, we conclude that there is a dehydration problem with the lenses. A lens of 74% water such as the D4 would be expected to draw large amounts of aqueous fluid from the tears to maintain a consistent hydration[4]. This in turn leads to the dry eye symptoms noted in the study. Solution problems have been ruled out since a solution reaction typically occurs immediately after lens application and not delayed for 1 to 2 hours such as seen in this study's subjects[5]. None of the subjects demonstrated solution sensitivities and two of them have used the Softmate PS solutions in the past without problems.

It is interesting to note that the three first-time wearers were more successful than the six previous wearers. Even though two of these left early for reasons other than related to lens comfort, they still showed no symptoms like the other subjects did after a comparable amount of wearing time. The most successful subject did not report drying symptoms or decreased wearing time until after 5 months of wear. The exact reason for the better success with the first-time wearers is unknown. It may be a motivational factor or merely that these subjects are less sensitive to lens problems due to no prior wearing experience.

The ocular health changes noted in three of the subjects are not necessarily a direct result of the D4 lenses, the Softmate solutions, or the type of

disinfection used. GPC and corneal edema have been demonstrated in soft lens wearers in general[6].

In fitting the Durasoft 4 soft lens, the keratometry guidelines given for trial fitting are not always going to work. Based on these guidelines alone, we should have fit every eye in the study with the 8.6mm base curve lens. Trial fitting should definitely be done with the lenses before ordering to ensure a proper fit.

The D4 lenses do seem to be durable enough to withstand daily disinfection. We did see two lenses torn but occasional torn lenses can be expected with any soft lens wearer.

The 0.09mm center thickness definitely contributes to the difficulty in handling the D4 lenses. They tend to roll up or fold in half, but by allowing them to air dry for a few seconds, they rest very nicely on a finger tip. It is extremely difficult to determine if they are inside-out or not, either by subjective symptoms or by slit-lamp observation.

It would be of interest to determine if extended wear of Durasoft 4 lenses reduces symptomology or if there is no difference. Other solution regimen alternatives should be studied, specifically non-preserved solutions.

ENDNOTES

[1]Samuel Loshaek, Ph.D., "The Durasort 4: Incorporating five R & D Goals," Contact Lens Spectrum, Aug., 1987, p. 43.

[2]Loshaek, p. 44.

[3]Loshaek, p. 44.

[4]Robert B. Mandell, O.D., Ph.D., Contact Lens Practice, 3rd. edition, (Springfield, IL, 1981), p. 500.

[5]Jimmy D. Bartlett, O.D., Siret D. Jaanus, Ph.D., (eds.), Clinical Ocular Pharmacology, 1st edition, (Stoneham, MA, 1984), p. 347.

[6]Mandell, pp. 585, 593.

[7]R.A. Koetting, O.D., "Predicting Soft Lens Surface Problems," Contact Lens Forum, Vol. 1, No. 6, 1976, pp. 18-21.

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APPENDIX A

Heat Disinfection Instructions.

1. Prior to all lens handling, clean hands are essential! Use a mild, deoderant-free, unscented soap.
2. Lens Care
   a. Softmate PS Daily Cleaning Solution - Removes oils, grime, and debris Take lenses out one at a time and place each in its respective basket in the hydramat cleaning unit. Fill chamber 1/2 way to the line, replace cover and rotate the moveable top back and forth for 20-30 seconds. Remove cover and discard solution. **NEVER RE-USE ANY SOLUTIONS!**

   b. Softmate PS Saline rinse - One at a time, take the lenses and place them on a finger, squirt them with saline.

   b1. Once weekly only - Allergan Extenzyme - Removes protein
   Using Softmate PS Saline, dissolve one tablet in each vial. Fill to the line. Place each lens in its respective vial. Soak for 2 hours, no more, no less. Rinse with saline and then disinfect.

   c. Heat Disinfection - Kills bacteria - Fill each well of the thermal lens case with Softmate PS Saline. Remove one lens at a time from the hydramat. Place each lens in its respective side of the thermal case and screw on the covers. Place the case in the heating unit and close the lid. Press the black button and the red light should come on. When the light goes off (about 45 minutes), allow the lenses to cool enough to touch, then they may be worn again. Or, you may just leave them in the unit over night and they will be ready to wear the next morning. Be sure to rinse with saline before wear!

   Rinse the hydramat and thermal case with tap water and store both right-side-up with covers off to air dry.

   d. Softmate PS Comfort Drops - Use as needed to re-wet the lenses and to improve comfort.

3. Care Cycle - Clean and disinfect the lenses once daily before bed-time and enzyme once weekly.

COLD DISINFECTION INSTRUCTIONS

1. Prior to all lens handling, clean hands are essential! Use a mild, deoderant-free, unscented soap.
2. Lens Care
   a. Softmate PS Daily Cleaning Solution - Removes oils, grime, and debris Take lenses out one at a time and place each in its respective basket in the hydramat cleaning unit. Fill chamber 1/2 way to the line, replace cover and rotate the moveable top back and forth for 20-30 seconds. Remove cover and discard solution. **NEVER RE-USE ANY SOLUTIONS!**

   b. Softmate Disinfecting Solution rinse - With the lenses still in the baskets, rinse them by squirting them thru the holes in the basket with disinfecting solution.

   b1. Once weekly only - Allergan Extenzyme - Removes protein
   Using Softmate PS Saline, dissolve one tablet in each vial. Fill to the line. Place each lens in its respective vial. Soak for 2 hours, no more, no less. Rinse with saline and then disinfect.

   c. Cold Disinfection - Kills bacteria - Fill vial of hydramat with Softmate Disinfecting Solution. Replace cover and securely screw it down. Let the lenses soak for a minimum of 4 hours and ideally overnight. Rinse the lenses well with saline and wear.

   Rinse the hydramat with tap water and leave it right-side-up with the cover off to air dry.

   d. Softmate PS Comfort Drops - Use as needed to re-wet the lenses and to improve comfort.

3. Care Cycle - Clean and disinfect the lenses once daily before bed-time and enzyme once weekly.

APPENDIX B

PROGRESS EVALUATION WORKSHEET

Patient_____ Date_____
Intern_____ _____Progress_____week of study
Max. wearing time_____ W.T. this exam_____
Lens power/Base curve OD_____/_____ OS_____/_____
Disinfection type_____ OAD_____
Qestions/Problems_____

Subjective Symptoms_____

Visual Acuity OD
Far Near
Thru Contact Lenses OS_____
Refraction
Static Retinoscopy OD_____20/_____
OS_____20/_____
Subj. BVA OD_____20/_____
OS_____20/_____
Subj. Best Sph eq. OD_____20/_____
OS_____20/_____

Slit Lamp Eval.
Movement OD_____OS_____
After Blink OD_____OS_____Upward gaze OD_____OS_____
Left gaze OD_____OS_____Right gaze OD_____OS_____
Centering OD_____OS_____
Lens appearance OD_____OS_____

Corneal appearance OD_____OS_____

Lids OD_____OS_____

Lens Shape OD_____OS_____
Lens Discoloration OD_____OS_____
Lens Deposits/Films
OD_____

Grade 1 2 3 4 A C F G S a b c d
OS_____

Grade 1 2 3 4 A C F G S a b c d

Subj. BVA w/o Lenses OD_____20/_____
(only if O.R. shows discrep.) OS_____20/_____
Notes:

ADVISOR SIGNATURE_____

* Deposit and film grading as proposed by Koetting[7].