CLEK Study: Five More Years!

As of September 30, 1999, the CLEK Study received news from the National Eye Institute that the study had been "administratively extended" through 2004. This means that the federal government feels that enough good information is coming out of the CLEK Study about keratoconus to warrant learning even more. One of the most difficult feats of an observational project like CLEK is "assembling the cohort." That refers to the effort put forth by the 16 clinical sites and the more than 1,200 patients at baseline to create this unique group of keratoconus patients. It is hard to imagine scientists putting forth that much effort again in the near future. So, it makes sense to continue following the 1995-96-enrolled cohort of patients to learn as much as possible.

We already know that keratoconus is a progressive disease, but future CLEK Study data will describe whether it progresses rapidly or slowly and whether there are patients who progress significantly slower or faster than the average patient with keratoconus. We will measure that progression in terms of vision, status of the cornea, vision-specific quality of life, contact lens tolerance, and many other factors. We will continue to determine how these factors interact in keratoconus.

In particular, the extension will enable us to see how keratoconus patients who elect to have a corneal transplant in one or both eyes fare. The CLEK Data Monitoring and Oversight Committee—an outside panel of vision experts—has asked that we gather information from patients and their surgeons after corneal transplantation. Even though only a small number of CLEK patients elect to undergo corneal transplantation each year, they will help us learn about this treatment option for keratoconus.

The extension through 2004 has been budgeted to allow us to reimburse the patients slightly more for each study visit. We understand that the CLEK Study visit is a long examination and that patients donate 3-4 hours per year to participate in the study. Beginning with the fourth year's follow-up visit, we are reimbursing patients $50 to cover the costs of their CLEK examination.

The CLEK Study personnel are excited about the prospect of conducting an observational study that will follow the largest number of prospectively assembled keratoconus patients—ever—for the longest period of time. It means that everyone’s hard work and effort—doctors, technicians, study coordinators, and patients alike—will yield important benefits in our search for new knowledge about keratoconus.

- Karla Zadnik OD PhD, CLEK Study Chairman

Dr. C. Denise Penstel has assumed the central position of Principal Investigator at the University of Alabama at Birmingham School of Optometry for the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) study. Here she is seen surrounded by the UAB "CLEKkes." The UAB site just went through its 4th site visit, performed by Dr. Tim Earington on September 27, 1999. The UAB Site Coordinator is Ms. Maria Voce, (standing, on right) who has been with the study since it began at UAB in 1995, and sometimes assisting in the study is Ms. Clara Edwards (standing, left). Dr. Carol Rosenstiel (sitting, right) and Dr. William J. Benjamin (sitting, left) will continue as clinical investigators in the renewed study.
A Rose for Every Cone?

As we approach the 21st century, we are continuing to learn more about keratoconus. Our understanding of keratoconus on a molecular level is still in its infancy. The CLEK Study is continuing to gather data on the course of the disease. Meanwhile, the number of contact lens options for keratoconus is increasing every day. With all the different contact lens options available, it may be difficult for patients and doctors to determine which option will give the best vision and comfort. Researchers at The Ohio State University College of Optometry are conducting clinical trials with several contact lens options for keratoconus.

One of the newest contact lens designs for keratoconus is the Rose K lens. This lens was originally developed by an optometrist in New Zealand. In 1995, Dr. Rose received approval from the FDA to market the Rose K lens in the United States. Since that time, the advertising has claimed that the lens offers better visual acuity, increased patient comfort, and easier fitting compared to other keratoconic contact lens designs. The use of this lens in private optometric practice is increasing. To date, there have been no published clinical trials investigating the performance of the Rose K lens.

Karla Zadnik, OD, PhD and Aaron Betts are going to enroll 30 patients with keratoconus in a clinical trial to investigate the marketing claims of this lens design. This study will be funded in part by a grant from Beta Sigma Kappa Optometric Honor Society. Anyone interested in participating in this study should contact Aaron Betts at (614) 688-5360.

Aaron Betts, 4th Year Student
The Ohio State University College of Optometry
Second Lieutenant
US Army Medical Service Corp.

What’s Coming Up?

The Executive Committee of the CLEK Study — Joe Barr, Tim Edrington, Don Everett, Mae Gordon, Tim McMahon, and Karla Zadnik — met at the Ohio State University College of Optometry in mid-September to continue discussions about a treatment trial of contact lens fitting methods in keratoconus. We have long discussed such a trial, since 1988 in some fashion or another, in fact. Now, we are putting in the effort needed to write a federal grant proposal to obtain funding for just such a project.

The proposed submission date for the grant proposal is June 1, 2000. The grant submitted will actually be a "pile" of grants from the Chairman's Office, the CLEK Photography Reading Center, the Coordinating Center, the CLEK Topography Reading Center, and participating clinical sites.

The idea is to evaluate whether fitting rigid contact lenses so that they either touch or clear the center of the cornea affects vision, contact lens comfort, the onset and/or progression of corneal scarring, and quality of life. In other words, does it make a difference to the keratoconus patient if his or her doctor chooses one contact lens fitting method over another?

It has long been a topic of debate as to which method of fitting contact lenses is most effective in keratoconus. Although there are other contact lens modalities available to doctors and their patients, the vast majority of contact lens patients wear rigid gas permeable contact lenses. Less than 5% of CLEK patients wear hybrid or piggyback lens designs. Thus, the mainstay of keratoconus treatment with contact lenses is with rigid lenses, but there is still uncertainty in the eye care community about how best to fit those rigid lenses. The clinical trial we would like to do will help solve this dilemma.

CLEK patients and non-CLEK patients with keratoconus who satisfy the clinical trial's entry criteria will be eligible for the clinical trial. Patients will be enrolled in the trial for at least five years and will be randomized to being fitted with either flat-fitting or steep-fitting rigid gas permeable lenses. Patients will be supplied with the contact lenses courtesy of the study for the duration of the study. Patients will be seen every six months after the initial fitting and will undergo examinations similar to the CLEK examination once a year.

The clinical trial will have an external Data Safety and Monitoring Committee that will oversee the data generated by the project on an ongoing basis. If it is determined in the middle of the study that one of the treatment methods is much better, or much worse, than the other, the study will be stopped. More likely, the study will generate information at the end that will better enable eye care practitioners to fit their keratoconus patients with the very best, safe, and effective rigid contact lenses.

Karla Zadnik, OD PhD, CLEK Study Chairman

CLEK Trivial Pursuit

Through the end of October, 1999...

- CLEK patients have taken time from their personal schedules to complete a total of 4992 examination visits.
- The clinic staff recorded the results of these visits on forms totalling 157,979 pages.
- As part of their FDACL examination, CLEK patients have tried on 35,667 trial lenses...without complaining!!
- They have sat patiently in the examining room and read a total of 2,221,158 letters off the visual acuity eye charts.
- CLEK patients have stared unflinchingly while clinic photographers have taken a total of 221,817 slide photographs of their eyes (Gloria Scott-Tibbs says:
“Whew! No wonder I am so tired!”

- The CLEK Photography Reading Center (CPRC) has processed nearly 10,600 rolls of film.
- CLEK personnel have administered some 19,968 eye drops to dilate the eyes for the fundus examination...that's approximately 1.17 liters (1.17 quarts) of drops.

Joel Achtenberg, MSW
Senior Research Analyst
CLEK Coordinating Center
Washington University Medical School
Dept. of Ophthalmology & Visual Sciences

Vision-Specific Quality of Life Following Penetrating Keratoplasty for Keratoconus

Approximately 10 to 20% of keratoconus patients ultimately progress to a corneal transplant for treatment of their vision problems. While we know that the quality of vision is often improved, we do not know much about patients’ perceptions of their quality of life following a corneal transplant. Drs. Jeffrey J. Walline and Karla Zadnik of The Ohio State University College of Optometry and Mark J. Mannis of the University of California, Davis Department of Ophthalmology propose a study to examine patients’ perceptions of their vision-related quality of life following penetrating keratoplasty for keratoconus. We will administer the National Eye Institute—Visual Function Questionnaire to patients prior to their surgery and 3, 6, 12, and 24 months after penetrating keratoplasty. Initially we will gather cross-sectional results to assess the quality of life, but we will also gather longitudinal data on some subjects to follow their perceptions over time. We will also measure visual acuity, corneal curvature, and ask questions from the CLEK Study about contact lens wear.

The study will be supported by a grant from the National Keratoconus Foundation and will begin in spring 2000.

Jeff Walline, OD MS
The Ohio State University
College of Optometry

CPRC Musical Chairs

New CPRC employee, Beth Oglevee (left), Gloria Scott-Tibbs (standing) and Sarah Grimm (4th year Optometry student, sitting), sort, stamp and organize the multitude of slides arriving at the CLEK Photography Reading Center (CPRC).
One, two, three...shift one chair to the right...

CPRC News

The CLEK Photography Reading Center has recently expanded its numbers. Beth Oglevee has joined the staff as a research associate. In addition to her CLEK responsibilities, Beth will be the coordinator for additional studies in the OSU College of Optometry. Beth has been an employee at OSU for 25 years, working for the College of Medicine at the University Hospitals in the Department of Infectious Diseases. She brings with her several years of experience in research and tremendous organizational skills (important when you have processed approximately 250,000 slides so far). She is married and has a 12 year old son.

This is the busiest time of the year for the CPRC due to the volume of patient visits and slides from all over the country. The CPRC staff, especially Gloria and Beth, have also been working on installing the new filing cases and system to house the volume of slides expected for the full eight year study.

To date the CPRC has processed over 10,000 rolls of film or over 250,000 slides. Including outcome and quality control reading, our photography readers, Gil Pierce, Marjorie Jeandervin, Roanne Flom, Mohinder Merchea (and prior to leaving OSU, Robert Steffen) have read slides.

CPRC Readers have now read over 94,222 slides!

Gloria Scott-Tibbs
CPRC Coordinator

Clek Website:
http://www.optometry ohio-state.edu/CLEK/default.htm
Q. What are the rare, the newest and possible future treatments for keratoconus?

One rare treatment is gas permeable scleral contact lenses which fit over the entire front of the eye. “Semi-scleral” gas permeable rigid contact lenses are also being used. These lenses cover the entire cornea like a soft lens does. Another approach which may be underutilized, although it is more work for both the patient and practitioner is piggyback: a soft lens with a rigid lens over the top. Another twist to this treatment is using the new highly oxygen permeable silicone hydrogel as the soft lens and the best fit rigid gas permeable over the top.

Nonsteroidal anti-inflammatory drops (not FDA-approved for keratoconus) are being tested to minimize discomfort for keratoconus.

In the distant future, using enzymes such as protease inhibitors to minimize corneal tissue changes in keratoconus or proteases to allow the cornea to be reshaped will probably be investigated.

Q. Keratoconus was just discovered in both of my eyes. It is at the level of a corneal transplant in my left eye. Please let me know what other options I have besides corneal transplant.

When vision gets very poor (worse than you can tolerate to do your work or get through your day) or comfort with rigid contact lenses is not adequate for enough hours to satisfy your needs, corneal transplant is considered. Most practitioners recommend at least one more try with contact lenses in the hands of a very experienced practitioner, and some patients would like to avoid surgery at all costs. Here are the advanced contact lens and some other options to consider:
- Piggyback (soft lens under a rigid lens)
- Semi-scleral rigid lens (fits over the entire cornea and just beyond like a soft lens)
- Scleral lens (not fitted in many places)
- SoftPerm lens (a rigid center, soft periphery lens)

Also, consider asking an experienced corneal surgeon about phototherapeutic keratectomy. A small number of keratoconus patients may benefit from this laser procedure or other minor surgical procedures that are not as invasive as penetrating keratoplasty. However, LASIK or PRK laser procedures are rarely recommended for keratoconus patients.

Q. I have had keratoconus for over two years now, and nothing has been done except that I visit my doctor every 3 months. I would like more information if you can give it to me. I am only 23 years old and would like as much information as possible.”

You can contact the CLEK Study Chairman’s Office: The Ohio State University College of Optometry 338 West Tenth Avenue Columbus, OH 43210-1240 for a copy of all CLEK scientific papers. You can contact the National Keratoconus Foundation at 8631 W. Third St #520E, Los Angeles, CA 90048, (800)521-2524, or nkcf@csmc.edu, for their pamphlet on keratoconus and to get on their keratoconus patient mailing list. Lastly, make a list of your questions and ask your eye doctor for an appointment specially scheduled to allow you time to talk with him or her about your specific case of keratoconus in detail. Then, ask your questions one by one!

Q. I am undergoing a corneal transplant and am curious about what to expect.

Although every patient’s experience is different, there are some universal experiences that occur with corneal transplantation. The archives of “keratoconus-link” a network for keratoconus patients can be read by joining <keratoconus-link@ucdavis.edu> on the internet. Please join keratoconus-link as described on page 6 to enable access to the archives. Many of the postings are from patients before and after they have a corneal transplant done. It will give you a good idea as to the range of patient experiences with corneal transplantation. You should also ask a prospective corneal surgeon specific questions about the experience. Inquire whether he or she thinks general or local anesthetic would be best for you. Ask how long you will be off work, restricted from lifting heavy objects, embargooed from showering, etc. Ask when you will receive your first postoperative glasses prescription and when you might be able to be fitted with a contact lens postoperatively (if you want one or need one). Ask about eye drop use: what drops you will use and how often and for how long. Ask about that particular surgeon’s experience with transplant rejections. In short, although there are things that may happen to all patients, your individual surgeon can give you an idea of what the corneal transplant experience is like when performed by him or her.

Q. I was diagnosed with keratoconus approximately three years ago and am interested in more information about the study and if I can become part of the study.

Enrollment in the observational CLEK Study closed in June 1996, so no more patients are being considered for that phase. But, as described in this newsletter on page 1, we are in the planning stages of a clinical trial to evaluate rigid contact lens fitting methods in keratocon-
Q. I was recently diagnosed with this condition and would like more information on the effects that this will have on my day-to-day activities.

Although keratoconus affects vision and often requires rigid contact lens wear (in 75% of the CLEK patients), there are few restrictions on activities imposed by having the condition. Patients can, literally, do anything they want and that their vision will allow them to do. This varies from patient to patient, of course, but we have keratoconus patients who scuba dive, perform surgery, work at computers all day, lift weights as a hobby, etc. In short, the sky's the limit! When a patient's vision or contact lens tolerance no longer permits him or her to do the things that make life worthwhile, doctors often encourage patients to obtain a consultation about corneal transplantation.

Q. Is there any association between Roaccutane and Keratoconus?

Isotretinoin (Accutane; Roaccutane) is given by mouth for the treatment of cystic acne. This agent is one of several vitamin A-like chemicals referred to as retinoids. Isotretinoin produces congenital anomalies in a number of species, including humans, where there have been reports of hydrocephalus, microophthalmia, ear, and limb abnormalities. There is also an increase in spontaneous abortion associated with use of this agent in pregnancy. Conjunctivitis has been reported in approximately 40% of patients in clinical trials. Cataracts, visual disturbances, corneal opacities, dry eyes, and decreased night vision have been reported in patients receiving isotretinoin. In addition, a decreased tolerance to contact lenses may occur during and after isotretinoin therapy. The decrease in night vision may have a sudden onset. Dry eyes, and decreased night vision usually do not persist; corneal opacities usually resolve with discontinuation of the drug. Accutane and keratoconus do not have any known relation. However, the dry symptoms may cause significant contact lens intolerance, which will be more of a problem for the keratoconus patient due to the need for lens wear to achieve usable vision.

Q. Is there a relation between keratoconus and Herpes simplex?

Even though there is an ocular form of Herpes simplex, a relation between keratoconus and Herpes simplex has not been established or theorized. Occurrence of both would be purely coincidental.

Q. Do people wear contact lenses and glasses together to make vision better with

keratoconus? What are the scleral lenses like for people with this condition?

Patients with mild presentations of keratoconus may be satisfied with their vision through spectacles or soft contact lenses. If the condition progresses and the cornea becomes more irregular in shape, the use of rigid contact lenses is generally required. Rigid lenses provide a uniform front optical surface resulting in improved quality of vision as compared to spectacle correction. Some keratoconus patients are prescribed spectacles to wear over their rigid contact lenses to correct an unacceptable amount of astigmatism or to provide a bitorical type of prescription.

Scleral (large diameter rigid contact lenses that cover the entire corneal surface) lenses are occasionally prescribed for more advanced keratoconus if standard designs are not successful. This is a more common practice in Europe than in the United States.

Aaron Betts, 4th Year Student
The Ohio State University College of Optometry
Second Lieutenant
US Army Medical Service Corp.
Timothy B. Edington, OD MS
Southern California College of Optometry
Timothy T. McManus, OD
University of Illinois, Chicago
Karal Zadnik, OD PhD
The Ohio State University College of Optometry

CTRRC

The Corneal Topography Reading Center (CTRRC) was initially funded in 1997 on a start-up basis and is now is fully funded as of September 1999. The CTRRC was established to analyze corneal topography data (color maps of the cornea) collected from CLEK patients since the beginning of the study. We believe this information will be very helpful in answering many of the CLEK Study questions.

Corneal topography is a measure of corneal curvature derived from applying mathematical algorithms to digital images of illuminated rings that are projected onto the cornea. Think of the image as a reflection of a many ringed “bulls-eye” of the cornea. By measuring the separation of the rings, the curvature and height of the cornea can be reconstructed. The numbers can then be coded into colors yielding the maps. As so often is the case, the “devil is in the details” and that is what we believe is the case in keratoconus.

The CTRRC will be dissecting these maps and carefully looking at these numbers. To give you an idea of the scope of the project, we anticipate evaluating 65,000 maps by study end.

Timothy T. McManus, OD, Director
CLEK Topography Reading Center
Study Participant’s Invaluable Perspective Regarding Study Extension

“The CLEK Study has been funded for another five years, so I am happy to be able to continue participation. It really feels good to consider that my involvement may be helping current and future keratoconus patients in the treatment of this condition.”

Researchers Assess How Keratoconus Patients Cope with Their Condition & Interact with Their Eye Care Providers

Eye care practitioners can appreciate the frustration and anxiety keratoconus patients experience related to their condition and the symptoms and complications it produces. It is evident that keratoconus can affect many daily activities and may significantly impact a patient’s vision-specific quality of life. Researchers Karla Zadnik, OD, PhD, Kerry Kordet, BS, and Jeffrey Walline, OD, MS, of The Ohio State University College of Optometry and Mark J. Mannis, MD, of the University of California, Davis Department of Ophthalmology are conducting a study to investigate how keratoconus patients cope with their condition and how they interact with their eye care providers. This study, entitled Assessment of Keratoconus Patients in a Health Care Environment, simply involves responding to two surveys from the convenience and privacy of home. First, the Millon Behavioral Health Inventory (MBHI) is a standardized assessment consisting of 150 statements people use to describe themselves. Each participant is asked to answer “true” or “false” as to whether or not the statement describes him or herself. In addition, participants complete a Subject Questionnaire compiled by the investigators regarding their general and ocular health history and mode of vision correction. To date, we have over 150 volunteers who are helping us better understand the full scope of how keratoconus affects the lives of patients living with this rare disease. Data analysis is ongoing and final results will not be available until next year. However, preliminary data indicate that the MBHI will be a useful clinical tool in evaluating the needs of a specific keratoconus patient and establishing the most suitable treatment plan.

At present, only keratoconus patients who subscribe to keratoconus-link, an email listserve on the World Wide Web for keratoconus patients and eye care providers, are able to participate in this study. Keratoconus-link serves as a worldwide, interactive forum for keratoconus patients to discuss problems and mechanisms of coping with their disease. Patients interested in subscribing to keratoconus-link should contact Dr. Mark Mannis at listproc@ucdavis.edu. The message on this email request should simply be “subscribe keratoconus-link.” Keratoconus-link subscribers and others can request further information about this study by contacting Kerry Kordet at MBHI@optometry.ohio-state.edu or by phone at (614) 292-6020.

Kerry Kordet, 4th Year Student
The Ohio State University College of Optometry

National Keratoconus Foundation Provides Guide to Eye Care’s Alphabet Soup

D = Diopeter - unit of measurement of lens refractive power
ECP = Eye Care Provider
epi = Epithelium-layer of cells covering the cornea, sclera, conjunctiva
FB = Foreign body
GPC = Giant papillary conjunctivitis
IOL = Intraocular lens (implanted at time of cataract removal)
K = Keratometry
KC = Keratoconus
N = Near / near vision
O.D. = Doctor of Optometry / Optometrist
OD = Right eye
OS = Left eye
OR = Over-refraction
OU = Both eyes
PKP/PK = Penetrating keratoplasty = corneal transplant
PMMA = Polymethylmethacrylate (material used in original hard lenses)
QOL = Quality of life
RGP = Rigid gas permeable contact lens
SCL = Soft contact lens
SLE = Slit lamp examination
VA = visual acuity
WNL = within normal limits

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Missouri Site News

Participants from the University of Missouri-St. Louis site were invited to attend an interprofessional meeting to discuss contemporary management of Keratoconus and the early results from the CLEK Study in April, 1999. The current and future state of keratoconus therapies were discussed by Karla Zadnik, OD, PhD, and Lawrence Gans, MD. Drs. Zadnik and Gans, who are outstanding teachers and leaders in eye care, demonstrated their breadth of knowledge for the spectrum of options available in the management of keratoconus.

Welcome to Zanshenee Blue who is now the Clinic
Studies Coordinator. Zan has served as clinic secretary in the School of Optometry Pediatrics Service for more than 2 years. Prior to that she was an assistant in a Chiropractic office performing various administrative and patient care functions. Zan says that she likes challenges is "quiet, confident, gentle and sensitive to the needs of others." It is good to have her on board.

Larry J. Davis, OD, FAAO
Associate Professor
University of Missouri Saint Louis
School of Optometry

Going and Coming

Our Cleveland CLEK crew is sad to see our dedicated technician Kimberly Supp leave. She started working at University Hospitals of Cleveland along with Dr. Szczotka 7 years ago and was part of the inception of CLEK at UHC. She has decided to manage her husband’s salon business, and spend time with her daughters (she is expecting in October!) We welcome Pam Smith to our crew, as well as Dr. Tom Stokkerman. “I think we have a great CLEK crew in Cleveland,” says Dr. Szczotka, “because we enjoy working together as a team, as well as interacting with all our CLEK patients. It’s a nice change to the week to spend a relaxed afternoon with familiar patients. It is no secret that Thursday afternoon CLEK days are the highlight of the week!”

Loretta B. Szczotka OD, MS
Principal Investigator
University Hospitals of Cleveland
Department of Ophthalmology

Reader’s Corner


CLEK Participating Clinics

The Ohio State University
College of Optometry
Chairman’s Office
Study Coordinator: Jodi Malone, RN (614) 688-5837

University of Alabama at Birmingham
School of Optometry
Study Coordinator: Maria Voce (205) 934-6734

University of California, Berkeley
School of Optometry
Study Coordinator: Pamela Quattle, MA (510) 642-5456

University Hospitals of Cleveland
Department of Ophthalmology
Study Coordinator: Stephanie Shaffer, MA (216) 844-7408

Gundersen Lutheran
Study Coordinators: Jill Nelson, COT and Janet Hess, COT, NCLC (608) 782-7300

University of Illinois-Chicago
Department of Ophthalmology & Visual Science
Study Coordinator: Jamie Putz, COMT, NCLC (312) 996-5410

Indiana University
School of Optometry
Study Coordinator: Lee Wagoner, MHA (812) 855-4093

UCLA School of Medicine
Jules Stein Eye Institute
Study Coordinator: Lillian Andaya NCLC, COA (310) 206-6351

University of Missouri-St. Louis
School of Optometry
Study Coordinator: Zansheree (Zan) Blue (314) 516-6885

Northeastern Eye Institute
Study Coordinator: Cheryl Haefele, COT (717) 342-3145

NOVA Southeastern University
College of Optometry
Study Coordinator: Arnie Patrick, OD (954) 262-1448

The Ohio State University
College of Optometry
Study Coordinator/Co-Investigator: Jason J. Nichols, OD (614) 688-5367

Pennsylvania College of Optometry
Study Coordinator: Theresa Sano (215) 780-1417

Southern California College of Optometry
Principal Investigator: Timothy Edrington, OD, MS (714) 449-7422

SUNY State College of Optometry
Principal Investigator: David Libassi, OD (212) 780-5037

University of Utah
Department of Ophthalmology
Study Coordinator/Technician: Kimberley Wegner (801) 581-6265
Electronic Network for Keratoconus Patients and Eye Care Practitioners

Mark J. Mannis, Director of the Cornea and External Disease Service and Professor of Ophthalmology at the University of California, Davis, and Karla Zadnik, Associate Professor and CLEK Study Chairman at The Ohio State University College of Optometry, co-moderate a network for keratoconus patients called “keratoconus-link”.

Join us for lively discussions about keratoconus in general, contact lens wear, corneal transplant experiences, and a variety of other issues.

To reserve your new subscription, simple send an e-mail message to:

listproc@ucdavis.edu

In the body of your message, type:

subscribe keratoconus-link YOUR NAME

Postings for discussion should be sent to:

keratoconus-link@ucdavis.edu

For more information (other than to subscribe),
Drs. Mannis and Zadnik can be contacted at:
mjmannis@ucdavis or zadnik.4@osu.edu