Keratoconus: The First Description Of The Problem

By Dr. William J. Benjamin

Keratoconus aficionados may want to take note that William Rowley, a surgeon in London, published what is thought to be the first written account of a case of keratoconus in the year 1773! The front page of his 188-page treatise is shown in Figure 1, and reveals a long title that was typical of those seen in that day: "A TREATISE ON THE PRINCIPAL DISEASES OF THE EYES; CONTAINING A CRITICAL AND CANDID EXAMINATION OF THE ANCIENT AND MODERN METHODS OF CURE, OF THE PRESENT DEFECTIVE MODES OF PRACTICE, WITH An Account of New, Mild, and Successful Methods for the Cure of Diseases of this ORGAN." This was one of a series of publications by Rowley on various medical topics over his years of practice, that were printed for F. Newberry on "the Corner of St. Paul's Church Yard" in London.

The first page of a chapter called "ON THE DISEASES OF THE TRANSPARENT CORNEA" is seen in Figure 2. This chapter did not mention keratoconus because the condition was not yet recognized at that time! However, in a subsequent chapter "OBSERVATIONS ON THE USE OF GLASSES," Rowley wrote a short paragraph of only two sentences about a patient who had a "convexity of the cornea" that "formed a conic point" and that "no glasses could remedy." Apparently, he had access to concave lenses and convex lenses (see Figure 3) but could not find better vision for his patient with either! It appears that the basic situation with respect to spectacles hasn't changed much over the last 225 years.

Figure 1. The front page of William Rowley's 1773 treatise on eye diseases.

Figure 2. The first page of the chapter on diseases of the cornea, which did not include keratoconus.

Continued on p.2
years! It's a good thing we now have rigid contact lenses!

While Rowley astutely identified the problem and its primary consequence in this paragraph (Figure 4), he also recorded the first theory regarding the origin of keratoconus! “This remarkable case happened from the force of crying aloud during a hard labour,” concluded Rowley, presumably on the basis of his interview with the patient, during which the patient claimed to have first noted poor vision after having had “a hard labour.” And that’s the way it was in the years just before the American Revolution!

CLEK Study Chairman’s Message

As we embark on the first sixth year visits of the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) Study, I am struck by its landmarks. It is the first large study of keratoconus funded by the National Institutes of Health (your tax dollars at work!). It is the first multicenter study funded in optometry. It is the first study to report on the frequency and the impact of corneal scarring in keratoconus. Eventually, it will assemble the largest group of keratoconus patients having undergone corneal transplant and report on why they had surgery and how they’ve done since the surgery. We hope to use the information from the CLEK Study to justify a clinical trial evaluating different contact lens fitting methods.

At our recent CLEK Investigators meeting, Dr. John Sterling of Gundersen Lutheran, Inc., our CLEK Clinic in LaCrosse, Wisconsin, described the study as “exciting” and “groundbreaking.” He thinks it’s the most exciting thing our doctors will ever have an opportunity to be involved in. We hope you share that excitement, too. We will continue to send you the research papers that get published from the study’s data. We will keep you updated with annual newsletters. The CLEK Study is only as good as your participation, so we hope you will "stick with us." If you can think of ways for our Clinics to make your visits easier, please let me know:

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We are currently looking at a variety of other aspects of keratoconus. We are describing how different the keratoconus is between patients’ two eyes. We are tallying quality of life results and finding out how keratoconus affects you when you tell us about your daily activities as they relate to your vision. We are learning about contact lens discomfort and the burden of keratoconus on your work and leisure. All of this information is completely new and has never been documented before. As the years go by, we will learn more about the progression of keratoconus and will be better able to predict your specific course. Stay with us, stay tuned, and stay in touch!

Clek Website:
http://www.optometry.ohio-state.edu/CLEK/
Zadnik Testifies Before Congress

WASHINGTON, DC - Calling it an important step in addressing some of the nation's most pressing health and social issues, AOA asked Congress to double the federal funding for eye-related research over the next five years.

In testimony March 15, Karla Zadnik, O.D., Ph.D., a leading researcher at The Ohio State University College of Optometry and chair of the AOA Council on Research, urged the Labor, Health and Human Services, and Education Subcommittee of the House Appropriations Committee, to increase funding to the National Eye Institute (NEI) to $620 million during the government's 2002 fiscal year.

The 21 percent funding increase next year would be in line with a proposal to double NEI funding over a five-year period.

The funding increase was proposed in Vision Research - A National Plan: 1999-2003, a strategic plan for American eye research developed by the National Advisory Eye Council.

The funding hike is necessary to close a widening gap between federal funding levels for eye research and other forms of health research, according to the AOA Advocacy Group.

Over the past four years, funding increases for NEI have been among the lowest for any of the National Institutes of Health, Dr. Zadnik noted during her testimony.

"This lag has hindered the progress of eye-related clinical research at a time when it is critically important", Dr. Zadnik said.

"Vision and eye health problems are the second most prevalent, chronic, health care problems in the U.S., affecting more than 120 million Americans. Children and the elderly are among the groups most at risk for vision problems", she said.

"With the nation's elderly population rapidly expanding, loss of independence due to visual impairment is a growing concern, not only among older Americans and their families, but within the federal government, which is bearing the increasing cost for senior citizen health programs", Dr. Zadnik noted.

Over 12 million older Americans already suffer from irreversible sight loss due to conditions like age-related macular degeneration, cataracts, glaucoma, and diabetic retinopathy.

NEI-sponsored research has already led to earlier diagnosis and treatment of age-related macular degeneration. Ongoing research funded by NEI seeks new treatments for the disease.

"A variety of promising new low vision assistive technologies warrant research", according to Dr. Zadnik. NEI also sponsors an innovative program to increase public awareness of visual impairment.

"With the nation's child population also growing, NEI studies on the identifying of amblyopia, strabismus, and refractive error in preschool children have taken on increased importance", Dr. Zadnik said.

"Such vision problems can significantly interfere with a child's ability to learn", she noted. She urged continued federal funding for clinical trials to evaluate treatment therapies.

"NEI research could also be important in eliminating health disparities among racial and ethnic groups", Dr. Zadnik added. "Ethnic minorities in the U.S. have significantly higher rates of vision problems due to diabetes, glaucoma, HIV/AIDS, and other diseases", Dr. Zadnik noted.

NEI research has already been important in demonstrating the effectiveness of drug therapies against CMV retinitis.

"While potentially critical to the well-being of children, the elderly, and minority groups, eye research is important to just about everyone", Dr. Zadnik added.

With about 60 percent of Americans having refractive errors requiring eyeglasses or contact lenses, she called for continuation of research into the causes and prevention of refractive errors.

NEI was founded in 1968 to conduct research for new treatments and cures for eye disease, visual disorders, and to preserve sight.
Q. Is there a "right time" for corneal transplant?

In general, keratoconus patients undergo corneal transplants as an elective procedure. It is very rare to have the keratoconus "get so bad" that surgeons must perform the procedure. People generally elect to have the surgery either when they can no longer tolerate contact lenses and/or when the contact lenses do not provide adequate vision for their everyday activities.

Q. What is the best way to find a skilled corneal surgeon?

The best way is to ask a trusted eye care practitioner. If you have been seeing an optometrist, for example, for your contact lens fitting, he or she probably has experience with corneal surgeons in the area and can recommend someone. Alternatively, if it is someone you've located through the Yellow Pages, local medical society, or the Internet, be sure that your surgeon is Board Certified in Ophthalmology, was educated in a corneal fellowship following his or her ophthalmology residency, and performs more than just a few corneal transplants each year. These are all evidence of expertise.

Q. Would you explain what a piggyback lens and a Soflens perm is?

A piggyback lens system is one in which the patient wears a soft contact lens with a rigid gas permeable lens over it. Each lens is cared for separately, although with compatible solutions, and the lenses are inserted separately. A Soflens, or so-called hybrid lens, is actually a rigid gas permeable lens center bonded to a soft lens "skirt." The lens is inserted and cared for as a single lens.

Q. I was planning on having "RK" surgery. My eye doctor diagnosed keratoconus and would not perform the procedure. What is the reasoning for this?

Radial keratotomy (RK) is a procedure where radial incisions are made that go part of the way through the cornea to flatten the central cornea and correct nearsightedness. It is not so popular ever since the development of laser procedures for the correction of nearsightedness. One of the problems with RK is its unpredictability. As you might imagine, the irregular curvature and protrusion of keratoconus only make RK more unpredictable, and the thinned keratoconic cornea would make the "most of the way through" the cornea incisions in RK very difficult to accomplish safely.

Q. I have been wearing hard contact lenses for over 22 years (before the day of gas permeable lenses). I was diagnosed with keratoconus a few months ago. Did my hard contact lenses contribute to this disease?

We do not believe that contact lenses cause keratoconus. However, there is literature that suggests this possibility. If keratoconus has a genetic cause, then you were destined to have it regardless of contact lens wear. There is recent biochemical evidence that contact lenses could complicate keratoconus but at this time, we strongly believe the benefits of the best vision obtained with state-of-the-art rigid gas permeable contact lenses far outweigh any potential risks.

Q. Does excessive eye strain for tasks such as computer-related work have any effect on my keratoconus?

Although eye strain from tasks like computer work may be irritating, it is not likely that it causes keratoconus to worsen. However, ask your doctor if other problems may be part of the problem such as focusing complications or binocular vision coordination. Sometimes special reading glasses can be helpful.

Q. I have been diagnosed with keratoconus in one of my eyes. What are the chances that my other eye will be affected at some point?

Our data suggests that only about 10% of cases of keratoconus are unilateral (affecting one eye only). We believe most persons end up with keratoconus in both eyes (bilateral), and it is common for one eye to be somewhat better than the other.

Q. I have keratoconus with a scar on one cornea. How can my vision be corrected? What long-term changes should I anticipate?

Scarring is a part of the natural course of keratoconus. The scarring generally occurs later or in more advanced stages of the disease. We believe scarring contributes to a decrease in vision and is not a simple issue to correct. Wearing rigid contact lenses will likely improve your vision compared to glasses at this point. If the vision is not "good enough", that would represent one of the indications for a corneal transplant operation, to replace your affected cornea with a healthy cornea.

Q. I have keratoconus in both of my eyes. I have undergone corneal grafting surgery in my right eye. I am wearing normal glasses now. My left eye is not severely affected. What can I expect in the future?

Great question. The simple answer is we don't know. There doesn't appear to be a predictive relationship where having one transplant means you will eventually need the
other eye operated on. On the other hand keratoconus is a "progressive" disorder, meaning things tend to worsen with time. The rate of progression is highly variable and goes nowhere is some folks and in some eyes. We hope that the CLEK study will give us further "statistics" for you and your doctor to better answer your question. Stay tuned.

Q. What is cornea transplant surgery? Is it the same as corneal grafting surgery?

Corneal transplant surgery is the same thing as corneal grafting surgery. The formal name for the operation is "penetrating keratoplasty". This operation consists of removing the central 2/3 or so of the host cornea (yours) and replacing it with donor cornea cut to the same shape. The tissue is sewn into place with very tiny sutures. The sutures hold the tissue in place until it scars and heals. This process takes months. The surgery is very common and is quite successful. In fact the best success seems to come with eyes with keratoconus. Even though the operation is highly successful, we wait until glasses or contact lenses no longer are sufficiently helpful because the risks associated with the surgery are greater than those found with glasses or contact lenses. We manage the risks vs. the benefits throughout the course of the disorder, adding risk only when it makes sense in terms of the benefits gained.

Q. My wife has been diagnosed with keratoconus. We are concerned that our children may inherit this disease.

The etiology or cause of keratoconus is not known. The issue of this disease being a hereditary disease pops up from time to time. This is one of those points in history where the issue of a hereditary origin for keratoconus is a popular one. A few facts for you: Somewhere between one-in-eight and one in ten families have other family members in their family tree with keratoconus. The rest don't. Therefore the likelihood that your children will have the disease is very small. On the other hand, when we look at family members of subjects with keratoconus using corneal topography measurements (color-coded maps of the corneal surface), a little over half of those family members will have unusual corneal topography suggestive of keratoconus but no other signs or symptoms of the disease. Therefore, for the present, the jury is still out as to whether keratoconus is an inherited disease or not. Clearly, the chance of one of your kids developing the symptoms of the disease is less than one-in-seven.

Q. I started wearing gas permeable hard contact lenses 5 years ago when I was diagnosed with keratoconus. I have recently started scratching my eyes and am experiencing much pain and discomfort. Should I stop wearing my lenses?

If you experience excessive discomfort, pain or blurred vision while wearing your rigid contact lenses, you should consult with your eye care practitioner. Discomfort may indicate the need for contact lens refitting or modification to your current lenses. It may also be indicative of a compromised cornea and the need for treatment with eye drops or temporary discontinuation of contact lens wear.

Q. Is keratoconus more prevalent in males or females?

Approximately 60 percent of the 1,209 keratoconus patients enrolled in the CLEK study are male, but we believe it affects men and women equally.

Q. Does hormonal therapy play a role in this disease?

It has been reported in the literature that hormone supplements may cause minor steepening of the cornea's curvature, but these changes are probably not clinically significant in affecting the natural course of keratoconus. More important clinically, hormone therapy may increase symptoms of dry eye leading to decreased lens tolerance and reduced wearing time.

Q. Does wearing contacts daily for 14-16 hours per day affect the physical integrity of my eyes?

Your contact lens practitioner will prescribe a maximum safe wearing schedule for your rigid contact lenses. This recommendation will be based upon the integrity of the corneas as observed with the slit lamp biomicroscope.

Q. Is there anything that can be done to alter the progression of keratoconus?

In the past, many eye care practitioners felt that rigid contact lenses should be fitted flat relative to the curvature of the cornea to retard or decrease the progression of keratoconus. Concerns were raised that fitting the lenses too flat could result in insult to the corneal tissue and resulting scar formation. The current thought is that rigid contact lenses should be fitted only to optimize vision, not to alter the course of the condition, and the lenses should only lightly touch the cone.

Q. I heard about a new surgery procedure that does not require corneal transplant. Is there information regarding clinics offering this procedure as an option to correct the keratoconus?

I am not sure what "new surgery procedure" you refer to. A few keratoconus patients are undergoing laser-assisted in situ keratomileusis (LASIK) and a plastic ring that's inserted into the cornea is being worked on in Europe. But, in my opinion, the corneal transplant is still the procedure of choice for keratoconus. If I were you, I would consult with your eye doctor and/or a corneal surgeon to better determine what your options are.

Q. I have had multiple episodes of rejection, ongoing photophobia in both eyes, and recent irritably in the left eye. I have been fitted with piggyback lenses in both eyes. A problem with the piggyback fit is that the hard lens that rests on the soft lens can roll or get blinked out rather easily, despite multiple fittings by a well-qualified optometrist.
I don't think there are many advances in contact lenses for keratoconus. The piggyback lens is often used as an option in advanced keratoconus. You might seek a second opinion on your fit. Unfortunately, short of sunglasses and hats, we don't have any wonderful solution for the photophobia some keratoconus patients experience.

Q. I am being transferred and will be unable to complete my annual follow-up visits at my CLEK Participating Clinic. Is my participation in the study complete or should I transfer to another CLEK participating clinic?

We can help! There are 15 CLEK Participating Clinics nationwide in addition to the CLEK Resource Centers. We value your continued commitment to this very important project. Your study office staff members are available and eager to service you. They will collect your new locator information and assist with the transfer of your study records to the nearest participating clinic. Of course, in the event that your plans include revisiting the area, you are welcome to maintain your affiliation in your current clinic. Your clinic coordinator will make every effort to coordinate your clinic visit with your travel plans.

Q. What are the rare, the newest and possible future treatments for keratoconus?

One rare treatment which is improved is gas permeable scleral contact lenses which fit over the entire front of the eye. "Semi-scleral" gas permeable rigid contact lenses have also been 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. Are there any other treatment options 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 our 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. Is there a relationship between wearing hard contact lenses and keratoconus?

Although even the scientific literature speculates about whether hard (or rigid) contact lenses may actually cause keratoconus, it is probably not the case. In any event, it is a "chicken and egg" argument. If a patient with early subclinical keratoconus presents to his or her eye doctor, the patient might very likely get fitted with rigid contact lenses to optimally correct his or her vision. Then, when full-blown keratoconus develops, did the contact lenses cause it? You can see that we would never be able to answer that question as long as rigid lenses are the primary treatment for keratoconus.

Q. What are Rose-K lenses?

Rose K lenses are rigid gas permeable lenses that were designed specifically for keratoconus. They are named after their creator, Dr. Paul Rose, an optometrist in New Zealand. The Rose K system was approved for marketing in the United States in 1995. Since its introduction, Rose K has been marketed as a lens that gives increased comfort and vision compared to other rigid lenses for keratoconus.

The Rose K system is known as a "proprietary design" for keratoconus. This means that the lenses can only be manufactured by labs that contract with Dr. Rose. An optometrist will fit the Rose K lenses from a trial set then order the lenses from an approved lab.

Q. How do I enroll in the CLEK Study?

Enrollment in the observational CLEK Study closed in June 1996, so no more patients are being considered for that phase. We continue to work on and refine the planned clinical trial to evaluate rigid contact lens fitting methods in keratoconus. Initial grant applications for funding have been completed. Please contact Jodi M. Malone, RN, CLEK Study Coordinator at malone.6@osu.edu, or the CLEK Clinic nearest you to let us know you'd like to receive information on the clinical trial when it begins to enroll patients.

Q. How does keratoconus impact activities of daily living?

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 a relationship between keratoconus and Herpes simplex?

Even though there is an ocular form of Herpes simplex, a relationship 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?

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 bifocal type of prescription.

Q. How do I obtain information on keratoconus?

You can contact the CLEK Study Chairman's Office:

The Ohio State University
College of Optometry
320 West Tenth Avenue
P O BOX 182342
Columbus, OH 43218-2342

You may request a copy of all CLEK scientific papers currently published. Additional copies of the Insight newsletter are also available. There are no fees associated with the request for information.

You can contact the National Keratoconus Foundation at:

The National Keratoconus Foundation
Cedars Sinai Medical Center
8733 Beverly Blvd., Suite 201
Los Angeles, CA 90048
(800) 521-2524
nkfc@csmc.edu
http://www.nkfc.org

You can request a copy of their pamphlet "What Is Keratoconus? A Reference Guide for Patients and Their Families". You may want to place your name 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!

Dr. Loretta Szczotka, Principle Investigator of the University Hospitals of Cleveland, Department of Ophthalmology, CLEK Clinic Site is working on a paper that will summarize the CLEK Study for the eye care community. Its abstract follows.

**Current Findings in the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) Study**

Loretta B. Szczotka, O.D., M.S.; Joseph Barr, O.D., M.S.; Karla Zadnik, O.D., Ph.D., and the CLEK Study Group

**Abstract:**

This paper of the Collaborative Longitudinal Evaluation of Keratoconus (CLEK) Study summarizes the study design and surveys the study results to date.

**Methods:**

The CLEK Study is a longitudinal observational study of 1209 patients with keratoconus enrolled at 16 clinical centers throughout the United States which started in 1995. Enrolled patients are examined annually for eight years. The study's main outcome measures are corneal scarring, visual acuity, corneal curvature, and quality of life.

**Results:**

The CLEK Study patients had a mean age of 39.29 +/- 10.90 years with moderate to severe keratoconus (95.4% of the patients had steep keratometric readings of at least 45 D, 77.9% had best corrected visual acuity of at least 20/40 in both eyes). Sixty-five percent of the patients wore rigid gas-permeable (RGP) contact lenses, and most of those (73%) reported that their lenses were comfortable. Most RGP patients were fitted with an apical touch (88%) lens-to-cornea fitting relationship. Fifty-three percent had corneal scarring in one or both eyes, and corneal scarring was significantly associated with corneal staining, contact lens wear, increased age of the patient, the presence of a Fleischer's ring, and a steeper cornea. Corneal scarring also significantly decreased both high and low contrast visual acuity compared to CLEK Study patient non-scared eyes.

**Conclusions:**

Our methods for assessing visual acuity, refraction, corneal curvature (via keratometry and the First Definite Apical Clearance Lens (FDACL)), and corneal scarring are good to highly repeatable. The repeatability of visual acuity and refraction in the CLEK Study are reduced in keratoconus patients compared to that reported in the literature for normal patients. The FDACL technique is a repeatable, new method for categorizing severity in keratoconus. Compared to the FDACL lens, most CLEK Study patients are habitually fitted an average of 2.86 D flatter. Corneal scarring was found to significantly diminish visual acuity in keratoconus and was associated with some factors that may be affected by practitioner intervention such as staining of the cornea, contact lens wear, and the contact lens fitting relationship.
Plan for the future: CLEK Clinical Trial

We are discussing our long-planned-for clinical trial of various contact lens management strategies for keratoconus for the future. Treatment options being discussed are two different ways of fitting conventional rigid gas permeable lenses and piggyback lens systems (a soft lens with a rigid lens over it). Methods of evaluating these treatment options would include vision, corneal scarring, contact lens comfort, and quality of life.

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 the committee determines 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

Reader’s Corner


### The Ant and the Contact Lens

Brenda was a young woman who was invited to go rock climbing. Although she was scared to death of heights she went with her group to a tremendous granite cliff. In spite of her fear, she put on the gear, took hold of the rope, and started up the face of the cliff. She got to the ledge where she could take a breather. While resting there, she safety rope snapped against Brenda’s eye and knocked her contact lens out of her eye.

Here she was, hundreds of feet above the ground and hundreds of feet to go to get to the top of the cliff, and she couldn’t see a thing. She desperately searched and searched and searched for her contact hoping that it had fallen onto the ledge that she was resting on or had fallen into her clothing, but she couldn’t find it.

As you can imagine Brenda started to get upset and decided that all she could do was pray to the Lord that He would help her find her missing contact.

Slowly but surely she climbed up the rope to the top of the cliff where her friends were waiting for her. When she got to the top a friend examined her eye and helped her look again in her clothing for the lens, but it was nowhere to be found. She sat despondent with the rest of the party waiting for the rest of her friends to make it to the top of the cliff. She looked out across range after range of mountains thinking of that Bible verse that says, "The eyes of the Lord run to and fro throughout the whole earth." She thought, "Lord, you can see exactly where my contact lens is, please help me."

Finally everyone was to the top and they walked down the trail to the bottom of the cliff. At the bottom there was a new group of climbers just starting up the face of the cliff. One of them shouted out, "Hey, you guys! Anybody lose a contact lens?" Well, that was startling enough, but do you know what the climber saw that made him ask the question?

An ant was crawling slowly across the face of the cliff, and he was carrying a small hard contact that was not scratched or broken.

**Kimberley Wegner, BS**  
*University of Utah*

### Be Glad You Weren’t There...

Leeches were used for the moderate and severe ophthalmias since the 1600s up until after the Civil War when concepts of microbes and the real causes of red and swollen eyes began to develop.

In moderate cases and in the less severe ophthalmias, the leeches were placed on the temple next to the eye that was inflamed, or both temples if the condition was binocular. In the severe and very severe cases, and especially venereal ophthalmias, the leeches were placed on top of the eyelids (eyes closed) and at the nasal canthi.

A good-sized leech could hold up to an ounce of blood, and more leeches were applied depending on the severity of the case. Once a leech pumped itself up to maximum size, it was replaced with a leech that was skinny. The applications of the leeches were performed by "technicians" in the doctor’s office, and the doctor would come along and oversee the progress of the patient during the sometimes lengthy ‘treatment’ periods.

Blood-letting in the very severe and super severe cases was done with a lancet at the temples and by scouring the undersides of the eyelids. In these instances the use of leeches was considered too slow.

In the severe cases, also, the patient was given a purge whose depth depended on the severity of the condition. Calomel, jalap, and other purgatives were given for consumption by the patient to rid the body of the causative agent. Ground-up millipedes obtained from rotting tree trunks were added to the patient’s meager diet because it was thought that millipedes contained great healing power.

**William “Joe” Benjamin, OD PhD**  
*University of Alabama at Birmingham*

### FDACL Award

Lou Rosenberg, OD, Jules Stein Eye Institute, UCLA, while chatting to a CLEK participant/public official during CLEK exams admitted to the Sheriff a traffic “indiscretion” 50 years ago. The Sheriff, in proper form, forgave him (as per the statute of limitations...) and instead awarded him the "Finest Defender of Automobile Cruising Speed in Los Angeles" (FDACL) Award.

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Thank You
for your commitment to this very important study!

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**KERATOCONUS-LINK**

**Electronic Network for Keratoconus Patients and Eye Care Practitioners**

The National Keratoconus Foundation moderates a worldwide forum for people with keratoconus. The forum is interactive, and participation includes a host of eye care practitioners - optometrists, ophthalmologists and contact lens fitters. This is an opportunity to share "KC" experiences, concerns and subject matter that is of general interest to all subscribers as well as the opportunity for direct link to information on other relevant Internet resources.

Individual diagnosis and medical advice is not offered, and the forum’s intent is to build camaraderie. It does not substitute for a subscriber’s advice from his or her personal eye care professional.

Subscribers may choose either an Individual (multiple messages through out the day) or Digest (one daily message with multiple attachments) participation format.

**In order to subscribe to the list an email message should be directed to:**

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