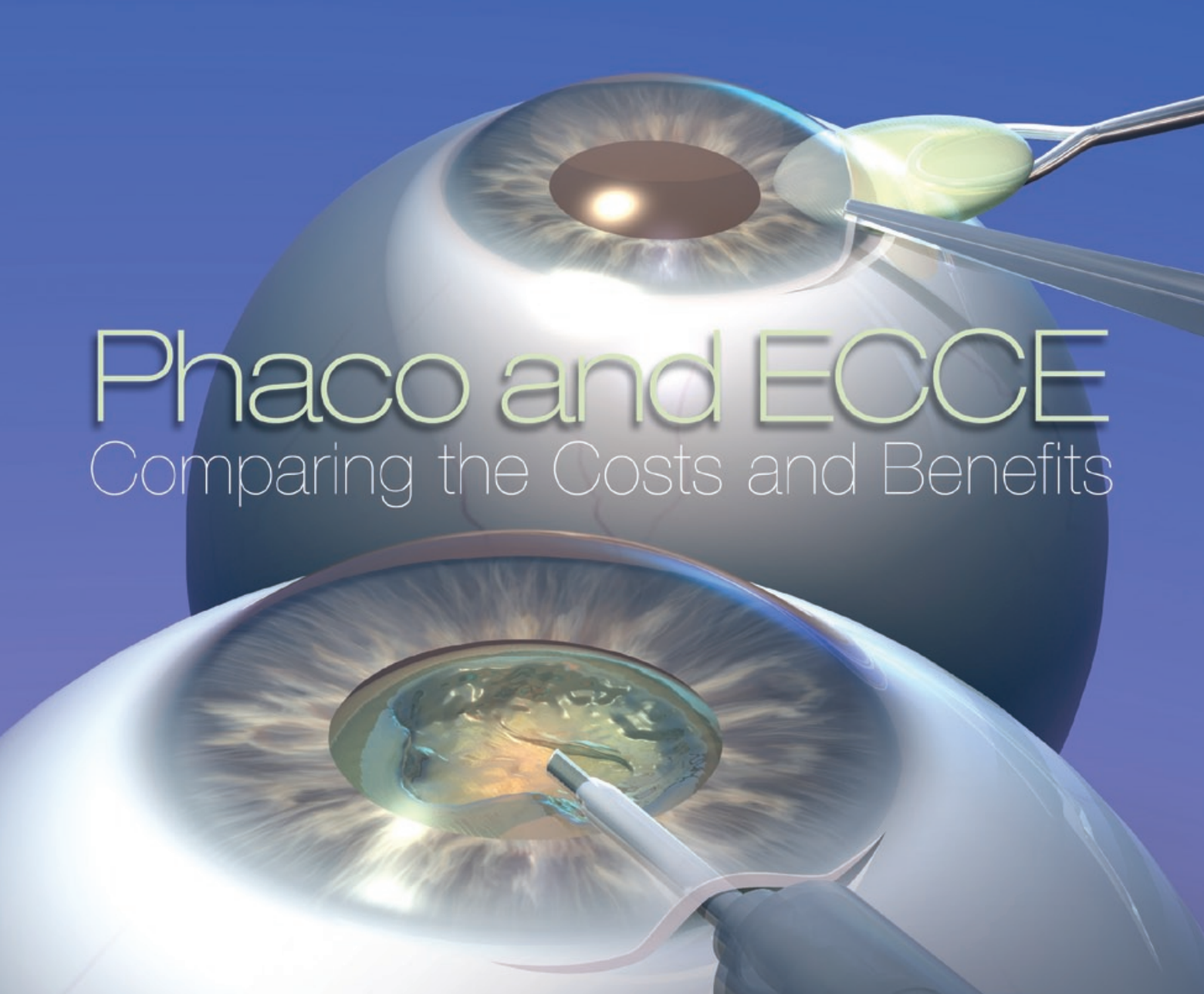


Phaco and ECCE

Comparing the Costs and Benefits

ALFRED T. KAMAJIAN

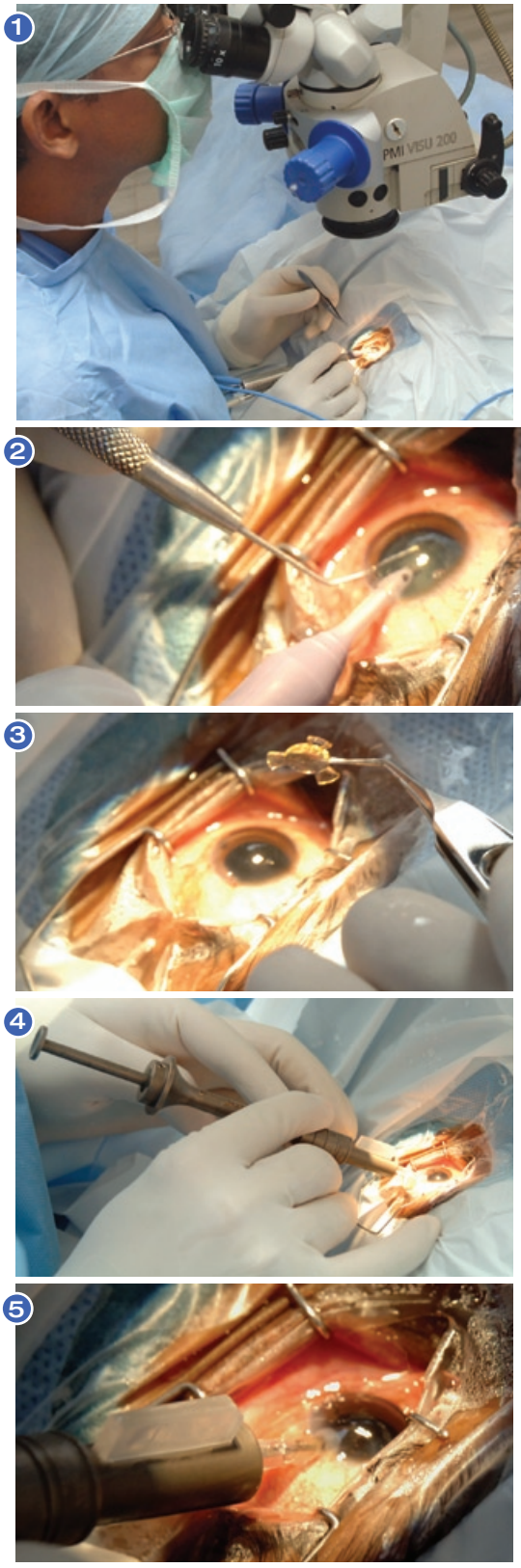
What would happen if a new technology increased costs more than it improved outcomes? That case might be made for contemporary cataract extraction, and in many situations around the world, the old surgery still trumps the new one.

For a number of years, phacoemulsification has been the method of choice for cataract extraction in developed countries. With increasingly advanced microprocessors, phaco can offer safe and elegant disassembly and aspiration of the lens and a rapid recovery for patients. But phaco is far more dependent on technology than the conventional extracapsular extraction (ECCE), and more costly. In an era of carefully scrutinized health care costs, policy analysts may ask if the price of phaco, especially in low- or middle-income countries, is worth its benefits.

To sort through the relative cost-effectiveness of both phaco and extracapsular extraction, *EyeNet* interviewed physicians in the United States, India and Chile for their perspectives. Most agreed, not too surprisingly, that phaco delivers good outcomes more rapidly for cataract surgery patients. While it's an expensive surgery, the presumed cost-effectiveness of phaco comes from its ability to return patients to work and to functioning lives much more quickly than conventional extracapsular extraction. It is the preferred surgery in developed countries with large health care budgets.

But that is not always so in the developing world, where cost can be a prohibitive factor in medical care and there is already a backlog of untreated

BY BARBARA BOUGHTON, CONTRIBUTING WRITER



PHACO. Dr. Garg initiates phacoemulsification surgery through a temporal incision (1 and 2); prepares to insert a hydrophilic foldable lens (3); and uses an injector to implant the lens through a 3.2-mm incision (4 and 5).

cataract. In many countries, extracapsular extraction has persisted and has even been refined as a reasonable and more realistic answer for treating cataract-related vision loss.

PHACO OR EXTRACAP: A MOOT QUESTION? To some physicians the question of whether phaco is better than extracapsular extraction might seem pointless. Many assume that phaco is firmly established as the gold standard for cataract treatment everywhere. However, according to an editorial in the *American Journal of Ophthalmology*, this standard was established without a single published randomized controlled trial comparing the technique of phaco to conventional extracapsular surgery.[1] In fact, peer reviewers initially rejected a randomized controlled trial from the British Medical Research Council comparing phaco with standard extracapsular extraction. When it was eventually published in the *British Journal of Ophthalmology* in 2001, the trial proved to be pivotal. Although it showed that there were indeed additional costs associated with phaco, the technology resulted in longer-term savings as a result of fewer postoperative visits and a more rapid rehabilitation for patients.

"With phaco, you can anticipate that patients will have a pretty smooth course afterward," said George G. Ulrich, MD, of Crown City Eye Center in Coronado, Calif. Because the incision is only a little over 3 mm, there is no need for stitches, and there's little risk of astigmatism afterward. One possible but relatively rare complication is that of a dropped lens, which can generally be resolved in consultation with a vitreoretinal surgeon, said Dr. Ulrich.

Exceptions to phaco. Are there patients for whom phaco is not an answer? While those with hard cataracts were once recommended for extracapsular extraction, even these cases are increasingly handled with phaco in the United States and other Western countries. "It used to be that it was difficult to emulsify hard cataracts, but the effectiveness of the phaco tip is now so good that most surgeons will even do hard cataracts with phaco," Dr. Ulrich said. Only those patients who have loose zonules, where the support of the lens is compromised because of ocular trauma or other eye conditions, are now reserved for extracapsular extraction, said Dr. Ulrich.

A CASE AND A PLACE FOR ECCE Phaco has become so dominant in developed economies that in most medical residency programs, extracapsular extraction for cataract patients is no longer taught, said Dr. Ulrich. Ironically, the advantages of phaco have resulted in an unanticipated downside for eye surgeons: Because they don't learn extracapsular extraction, it's much more difficult for residents to absorb the set of skills required for microscopic suturing inside the eye, said Dr. Ulrich. "The question of how to teach suturing is controversial. In residency programs that I've been involved in, such as the Naval Medical Center-San Diego and Duke University, residents gain suturing skills by working on animal eyes and in a laboratory setting," Dr. Ulrich said.

Where ECCE makes sense. Dr. Ulrich performs gratis cataract surgeries in Mexico one day each month as a member of a group called the Flying Samaritans. In parts of Mexico, where optimal health care is not always available, phaco is a much less practical technology than in the United States, Dr. Ulrich said. Transporting phaco equipment over the border is problematic, as is the expense of the equipment itself. "With extracapsular extraction, however, there's very little cost other than the

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fluid and some tubing. Even the cortical cleanup can be done with a manual device. In a humanitarian aid setting, extracapsular extraction is a much better solution," Dr. Ulrich said.

No repair guy or gal. Dr. Ulrich added that as well as requiring an investment in costly equipment, phaco requires access to biomedical engineers who can maintain the equipment. "If a phaco unit breaks down in a developing country, there may be no one in the entire country who knows how to repair it. So even when the units are donated, they often aren't used for a number of reasons. What often happens is they eventually break down, there is no means to have it repaired and they end up sitting in a corner gathering dust."

"These unusable medical equipment donations are often referred to as 'white elephants,'" said Baxter F. McLendon, MD, clinical professor of ophthalmology at the Medical University of South Carolina. Dr. McLendon has lived and worked extensively in developing countries such as Tanzania, Malawi, Ghana and Haiti.

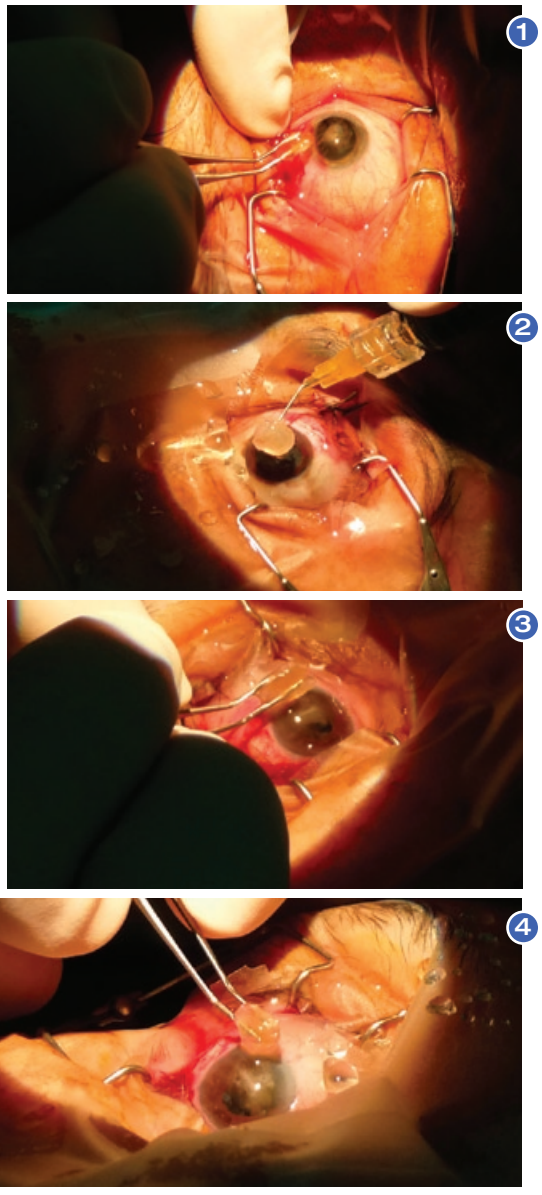
If complications arise from phaco, such as a dropped lens, vitreous surgeons may be few and far between in developing countries, Dr. Ulrich said. But complications from extracapsular extraction, such as astigmatism, can be more easily handled in developing countries.

ECCE IMPROVES: SMALLER INCISIONS, NO SUTURES

As an alternative to phaco, extracapsular extraction that can be done with very small incisions and no sutures has become increasingly popular in developing countries. In fact, there are now courses that teach the technique to American ophthalmologists who want to work overseas. "Large incision standard extracapsular extraction is still the most commonly performed cataract surgery in developing countries. It's not the best surgery—it takes longer for patients to recover vision and requires sutures, which can induce astigmatism. But manual, sutureless, small-incision, extracapsular extraction avoids some of these problems, without incurring the expense of phaco," Dr. McLendon said.

Excellence from India. India has emerged as a center of technical excellence for manual, sutureless, small-incision cataract surgery, or SICS. Coventional extracapsular cataract extraction makes a 12-mm incision at the superior limbus that is closed with sutures. In contrast, SICS removes the nucleus through a 6-mm scleral tunnel and aspirates the remaining cortex. Usually, the tunnel is self-sealing and does not need sutures. Indian ophthalmologists have published a number of papers in recent years comparing SICS to phaco.

Phaco vs. SICS: the costs. A 2007 paper by Parikshit Gogate, MS, FRCS, and colleagues, published in *Ophthalmology*, compared the cost of phaco with foldable lenses with that of SICS.[2] The title of the paper was provocatively direct: "Why Do Phacoemulsification? Manual Small-Incision Cataract Surgery Is Almost as Effective, but Less Expensive." The paper described a controlled trial comparing the safety and efficacy of the two techniques for rehabilitation of cataract patients. Using a database of 400 patients, who were treated by four surgeons, the cost was calculated based on the fixed facility cost (including the cost of the phaco machine) and the recurrent consumable cost divided by the number of procedures. Not surprisingly, the results indicated that the average cost for a phaco surgery was greater —$42 when converted from Indian rupees—than for SICS, which was only $15. If the fixed-facility cost of around $10 is factored out, then SICS was only $5, with the phaco more than six times as costly.



ECCE. Dr. McLendon removes the nucleus using Alfonso serrated forceps through a scleral tunnel incision (1) and removes the entire nucleus with a bent (Hennig) fishhook-shaped 30-gauge needle (2). Half of the nucleus removed from the anterior chamber with serrated forceps (3). Half of the nucleus removed with the remaining half still in the anterior chamber (4).

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NO MORE CLOUDY VISION. At the end of a long day of cataract surgery, Dr. McLendon enjoys some social time with his Ghanaian patients.

Phaco vs. SICS: outcomes and time commitment. Meanwhile, the visual results obtained in both surgeries were similar. There was little difference in uncorrected visual acuity at six weeks. In the phaco group 81.1 percent of patients achieved at least 6/18 without spectacle correction as compared with 71.1 percent in the SICS group. The authors also note that the average time required for a SICS procedure was significantly less than that for phaco (8 minutes, 35 seconds vs. 15 minutes, 30 seconds).

"In a busy facility, a surgeon would be capable of handling higher volume with manual sutureless small-incision extracapsular extraction," the authors write. "Thus the personnel costs for phaco would be higher."

Phaco also requires longer training and, thus, more experienced and better paid surgeons. Surgeons trained in conventional extracapsular surgery find it easier to learn SICS than phaco, the authors add, making it a better solution for developing countries, where ophthalmologists are in short supply.

SICS, a realistic solution. The lead author of the paper, Dr. Gogate, is medical director of the H. V. Desai Eye Hospital in Pune, India. He noted that there are more than 15,000 ophthalmologists in India and more than half do not know how to do phaco. While there is public health care available to those who cannot pay, government hospitals do not offer phaco because of the cost. Even those patients who can afford private health care may not be able to afford the cost of phaco.

At one institution in India that offers phaco, the L. V. Prasad Eye Institute in Hyderabad, Prashant Garg, MD, a senior ophthalmologist-consultant in the cornea and anterior segment service, estimates that 95 percent of his cases are done with phaco. Because the L. V. Prasad Eye Institute is supported by grants and donations, it can afford the cost of the more expensive procedure.

Both Drs. Gogate and Garg noted that as India has become more industrialized, phaco has been increasing. While the best centers in the developing world are adopting phaco slowly, along with foldable IOLs, millions of people in the developing world are going untreated for cataracts, according to both Dr. Gogate and the authors of another paper by Ruit and colleagues in the *American Journal of Ophthalmology*.[3]

Hard cataracts need SICS. The authors of the *AJO* report point out that as well as requiring expensive equipment and training, phaco often is not the best solution for the brunescent hard cataracts that are typical of populations in the developing world. These cataracts make phaco more difficult and time-consuming, they write, and prone to complication.

In fact, in that report, which contrasted phaco with SICS in a series of 108 patients with advanced cataracts in a rural Nepalese clinic, those patients randomly assigned to either surgery had similar uncorrected visual acuity one day postoperatively.

The outcomes at six months were also comparable. Eighty-nine percent of the patients who received SICS had UCVA of 20/60 or better and 98 percent had BCVA of 20/60 or better. By contrast, at six month, 85 percent of patients in the phaco group had UCVA of 20/60 or better and 98 percent had BCVA of 20/60 or better.

The surgical time for SICS was also significantly shorter than for the phaco surgeries—nine minutes vs. 15-1/2 minutes. And the surgeons used Indian-made PMMA lenses, which are less expensive than foldable lenses for phaco surgeries.

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"In the hands of experienced surgeons, both phaco and manual SICS achieved excellent visual outcomes, with low complication rates," the authors conclude. "Manual SICS was a faster and less expensive technique than phaco. For this reason, we believe that manual SICS is the more appropriate technique for addressing the large and growing backlog of blinding cataracts in the developing world."

SICS risks. Dr. Garg agreed that many of his patients who receive SICS can see 20/40 on the first day postoperatively. However, there is more risk of astigmatism with this surgery if the wound construction isn't properly done, he said.

There is also more risk of corneal edema on the first postoperative day than with phaco, he added. In the Ruit paper, posterior capsular opacification was a greater risk in the group that received SICS than in the phaco group.[3] Iris injury is also slightly more common with SICS, according to Dr. Gogate.

High local prevalence of hard, mature cataracts. Dr. Gogate performs both types of surgeries, but he explains that for the extremely hard cataracts seen commonly in India, he prefers manual sutureless small-incision extracapsular extraction. "In these patients, it's extremely hard to do phaco," he said.

And in India very mature cataracts are more common that those seen in the United States, he explained, because patients tend to be less able to afford surgery—and thus they put off obtaining medical care. Those who are senior citizens may also put off treatment because they have a fear of cataract surgery. Many remember the poor outcomes from cataract surgery of 10 to 20 years ago, when the technology in India was much less sophisticated, Dr. Gogate said.

CHILE MAKES PHACO THE STANDARD In contrast to ECCE's prominence in South Asia, the government in Chile has mandated phaco for cataract surgery in the state-run health system since 2004, when health care reform made cataract surgery a priority, said Fernando R. Barria von-Bischhoffshaunsen, MD. Dr. Barria is an assistant professor of ophthalmology at the Universidad de Concepción and is on staff at the Hospital Clínico Regional de Concepción Guillermo Grant Benavente in Concepción.

He has found that cataract surgery outcomes are much better with phaco compared with standard extracapsular surgery. "Patients can return to their normal life in a few days and recover their vision faster because they don't have induced astigmatism. Patients with extracapsular extraction usually are more complicated cases—often with a hard nucleus or lens subluxation—and they have more postop inflammation or induced astigmatism. As a result, they need to be seen more frequently and longer after surgery," he said.

Gracias por mi nueva visión. With phaco equipment, which the Chilean government rents or buys, more people get good visual results more quickly, Dr. Barria said. The use of phaco has actually popularized cataract surgery in the country, he added. "When the patient can go back to the community with satisfaction about their surgery, it's a very good thing for providing eye care. More people are then more likely to want cataract surgery, which increases the number of patients on our waiting list."

1 Wormald, R. P. *Am J Ophthalmol* 2007;143:143–144.

2 Gogate, P. et al. *Ophthalmology* 2007;114:965–968.

3 Ruit, S. et al. *Am J Ophthalmol* 2007;143:32–38.

Meet the Experts

Fernando R. Barria von-Bischhoffshaunsen, MD
Assistant professor of ophthalmology at the Universidad de Concepción and on staff at the Hospital Clínico Regional de Concepción Guillermo Grant Benavente in Concepción, Chile.

Prashant Garg, MD
Senior ophthalmologist-consultant in the cornea and anterior segment service of the L.V. Prasad Eye Institute in Hyderabad, India.

Parikshit Gogate, MS, FRCS
Medical director of the H. V. Desai Eye Hospital in Pune, India.

Baxter F. McLendon, MD
Clinical professor of ophthalmology at the Medical University of South Carolina in Columbia.

George G. Ulrich, MD
In private practice at Crown City Eye Center in Coronado, Calif.