Volume 2, Number 4, 2000

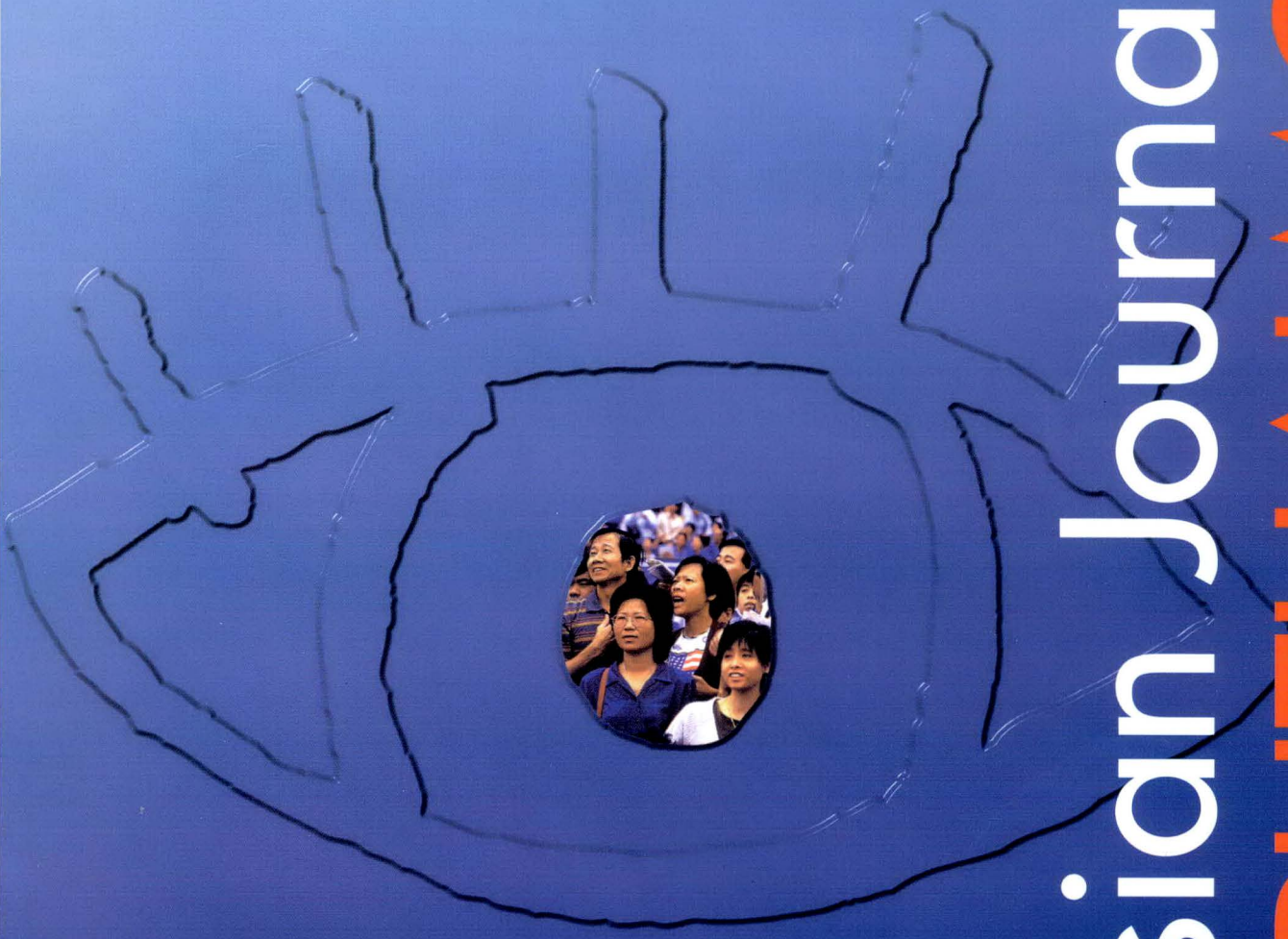
Multifocal Intraocular Lens Improves Quality of Life

Compliance with Medical Management in Glaucoma

Excimer Laser Photorefractive Keratectomy in Hyperopia

Blindness in Asia – the Facts

Sight Savers International



Asian Journal of OPHTHALMOLOGY

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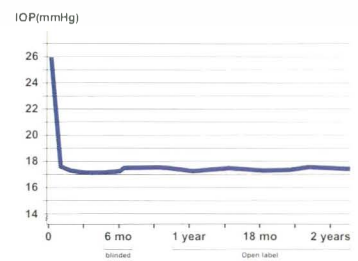
IOP GOES DOWN...

...AND STAYS DOWN.



Morning IOP evolution over time from untreated baseline to initial treatment effect and up to 24 months.
After 2 years of treatment, approximately 7% of patients required either additional medication or switch from Xalatan because of insufficient IOP control or side effects.

Xalatan used alone* can maintain low IOP for at least two years.[1,2] If patients become uncontrolled on timolol monotherapy, you may consider switching to monotherapy with Xalatan.[3,4]

Xalatan®
latanoprost ophthalmic solution

Pharmacia & Upjohn

1. Data on file: Hedman K, Alm A. Presented at the ICO; June 1998; Amsterdam, The Netherlands. 2. Watson PG. Ophthalmology. 1998;105:82-87. 3. Bucci M. J Glaucoma. 1999;8:24-30.
4. Data on file: Emmerich K-H. Graefe's Arch Clin Exp Ophthalmol. Accepted for publication. *Indication: Reduction of intraocular pressure in patients with open-angle glaucoma and ocular hypertension. PX 11294.00

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Asian Journal of OPHTHALMOLOGY is a quarterly publication for the practising ophthalmologist. As new technologies and therapeutic interventions are continually being developed, ophthalmology has become a field of rapid change, particularly in the Asia-Pacific region, where disease patterns and health care delivery differ greatly from that seen in the West. Whilst the focus of Asian Journal of OPHTHALMOLOGY is on glaucoma, other topics relevant to the region will not be ignored. Input from ophthalmologists and allied clinicians is welcomed. This will determine the content and direction of Asian Journal of OPHTHALMOLOGY.

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Multifocal Intraocular Lens Improves Quality of Life

The innovation of the multifocal intraocular lens (IOL) heralds a new era with another option for cataract surgery. The conventional monofocal IOL has become the standard visual rehabilitation during the past decades. Patients have had to depend on near-vision spectacles due to lack of accommodation, or they have to choose monovision from a disparity in both eyes for their daily lives. The multifocal IOL differs from the monofocal IOL in that it has forfeited the loss of contrast sensitivity, which is significant only below 11%. Patients with cataracts who have to spend their lives in a twilight environment and night-time work conditions may be disturbed by glare and ghostly images.

In Thailand, since June 1998, the multifocal IOL has become another choice for patients with cataracts who would like to maximise their quality of life with less dependency on glasses. However, patient selection is a crucial step. Suitable candidates are those whose myopic astigmatism does not exceed 1.0 diopter, spend their lives mostly in a normally lit environment and have no other ocular diseases. Patients with cataracts from all walks of life, ranging from homeworkers, architects, students, businessmen, and medical and paramedical personnel, have had multifocal IOLs successfully implanted with satisfying results.

Bilateral implants in patients with underlying hyperopia result in the most satisfying outcomes. Target emmetropia or a slight hyperopic shift minimises glare and visual disturbance. The multifocal IOL improves the quality of life in the new millennium.

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Compliance with Medical Management in Glaucoma

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Non-compliance with medical therapy has long been recognised as an important limiting factor in the medical management of many chronic diseases.[1,2] Patients with glaucoma who have lower rates of compliance are presumed to be at greater risk of developing progressive visual loss[3] and van Buskirk suggests that the problem of non-compliance is "*a leading cause of glaucoma blindness*".[4]

Medical therapy is a cost-effective strategy that can reduce the need for surgery.[5] However, poor compliance can adversely affect an individual's response to therapy since erratic dosing intervals can diminish the effect of a drug or increase adverse effects.[6] Rates of compliance with therapeutic regimens for chronic disease may be as low as 50% and non-compliance has been associated with an increase in hospital admissions, length of stay, and health care costs.[7]

Non-compliance may be minimised through an understanding of the reasons patients have for failing to adhere to therapy.[8] Compliance may vary depending on the type of illness and treatment, or even on a daily basis for a single individual. Patients may misunderstand the instructions, become confused about medications, or simply make inadvertent errors when trying to follow the schedule. Complex treatment regimens are associated with non-compliance;[5] since the risk of chronic disease often increases with advancing age, compliance in older patients may be further complicated by additional therapies for concomitant illness.

Factors Affecting Compliance

In recent years, many studies, both in general medicine and ophthalmology, have been performed to assess the impact of non-compliance on disease progression. While non-compliance is recognised as being difficult to determine with any certainty, Weintraub estimates that 10% to 25% of patients take none of their prescribed medication, some of whom do not even fill their prescriptions.[9] Approximately 25% to 35% of patients comply almost 100% with therapy, while a few people may even take more than the prescribed dose. The largest group are the partial compliers, who establish their own schedules.

Not surprisingly, the compliance rate is lower with suppressive or preventive medication than with treatment for acute symptomatic illness.[6] Compliance also seems to depend more on a given situation than on individual tendencies. The reasons most frequently given for non-compliance include feeling better, carelessness, insufficient money to fill the prescription, misunderstanding of directions, not feeling better, or side effects.

In addition, compliance studies have correlated non-compliance with psychiatric illness, complex therapeutic regimens, side effects, missed appointments, inappropriate health beliefs, increased waiting times in outpatient clinics, unfavourable impression of the doctor, and family instability.

Measurement of compliance is difficult and may not always be correct. For example, a patient history may not always be accurate, drug serum concentrations may suggest regular medication use when the drug is only taken shortly before the test, and pill counts show only the total pills taken but not the dosing interval.[7] The Medication Event Monitoring System (MEMS; Aprex Corp., Fremont, CA, USA) enables compliance studies to register accurately the pill-taking habits of individual patients in terms of the number of daily doses taken and how closely the prescribed schedule is followed.

Using MEMS containers, Cramer *et al.* were able to observe the compliance of 24 anti-epileptic drug users. 5599 of 7413 drug doses (76%) were taken as prescribed, with the compliance rate declining with

Non-compliance with Medication[6]

- Failure to take medication as prescribed — missed doses, inadequate doses, and premature discontinuation of therapy.
- Increased dosing with the aim of increasing the benefit of the medication.
- Improper timing of dosages — failure to comprehend the importance of spacing medications throughout the day, failure to integrate new medications into a complex treatment schedule, difficulty in correct timing of 6- or 8-hourly medications.
- Taking medication for incorrect reasons — confusion regarding the purpose of each drug when taking multiple medications.

Table 1. Overall compliance rate with anti-epileptic drug use by dosing regimen[7]

	Once daily (%)	Twice daily (%)	3 times daily (%)	4 times daily (%)
Compliance rate (range)	87 (73-99)	81 (44-100)	77 (52-90)	39 (3-68)

increasing dosing frequency (table 1).[7] The average pill count was 92%, with a range of 59% to 108%, indicating that some patients took more doses on some days and fewer on others. Five patients had at least one seizure associated with missed doses. These researchers concluded that despite the "*medically dangerous consequences*", patients with epilepsy took only 76% of their medication as prescribed.

Compliance in Glaucoma

If left untreated, glaucoma may result in increasing damage to the optic nerve, causing a reduction in visual field and, eventually, blindness,[5] yet a major barrier to the successful treatment of glaucoma is poor patient compliance with the treatment regimen.[10] Since glaucoma produces few symptomatic signs, there is little desire for patients to continue treatment, particularly when, prior to late complications such as visual field loss, the only symptoms may be the side effects of the medication.[6] The aim of therapy for glaucoma is to preserve vision with minimal side effects and inconvenience.[11]

A major determinant of compliance with glaucoma medication is a patient's awareness of having glaucoma and the potential for blindness — the more serious their visual loss, the more likely it is that patients will take medication as prescribed.[6] In addition, patients who miss follow-up appointments are more likely to misuse their medication. Non-compliance is further hindered by the physical inability of patients to use eye drops adequately, with difficulty aiming the drop, expelling the drop, and blinking on insertion frequently being reported.[12] Technical difficulties are termed 'dyscompliance'.

Judgements about patient compliance, and therefore alternative treatments, are often based on clinical assessments and measurements of intraocular pressure (IOP), pupillary diameter and reactivity to light, weight of eye drops used from a bottle, patients' reports, and the physician's subjective impression of the patient.[3] However, IOP and pupillary diameter have a low correlation with compliance with glaucoma treatment and pupillary response to light has a modest correlation. Similarly, non-compliant patients are not identified reliably by daily treatment records, questionnaire, or measuring the weight of the eye drops used. In addition, there is only a modest correlation between the physician's predictions about patient's compliance and the results of monitoring. Since none of these measures accurately indicates patients' compliance, an eye drop monitor is required for identification of patients who default from therapy.

Using an unobtrusive eye drop monitor as an objective measure, Kass *et al.* found considerable over-reporting of compliance with glaucoma medication in an interview situation (table 2).[13] Patients administered a mean of 76% of the prescribed dose, with 6% of patients taking less than one-quarter of their prescribed medication, and 15.2% taking less than half. However, when interviewed, the patients reported taking a mean of 97.1% of the prescribed dose (figure 1). This result suggests that patients are either unaware of their poor compliance or may fear a reprimand if they admit to taking medication incorrectly.

Granström identified 3 different deviations from the prescribed treatment in a study of 15 non-compliant patients using pilocarpine eyedrops 3 times daily:[14]

- inadequate spacing of doses during the day, with long intervals at night
- omitting the midday dose
- long interruptions in medication.

The number of missed doses reported by interview was inaccurately low when

Table 2. Summary of compliance by eye drop monitor and by patient report[13]

	Patient report		Eye drop monitor	
Percent of prescribed doses taken	Number	%	Number	%
0 - 24.9	0	0	11	6.0
25 - 49.9	0	0	17	9.2
50 - 74.9	2	1.1	35	19.0
75 - 100	182	98.9	121	65.8

Figure 1. Distribution of compliance with topical pilocarpine treatment as reported by the patients and recorded by the eyedrop monitor.

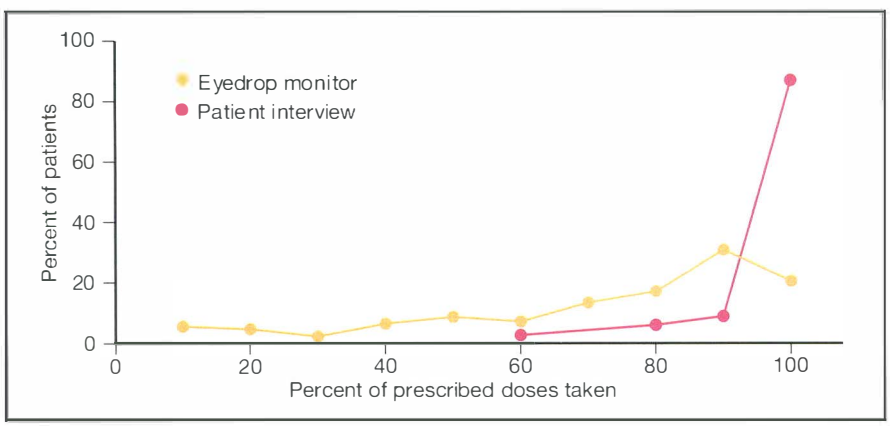

Table 3. Number of missed doses during 7 days according to interview and monitor data[14]

Patient number	Interview	Monitor
1	0	3
2	0	8
3	0	0
4	0	2
5	0	1
6	0	—*
7	—†	—*
8	0	8
9	0	8
10	0	3
11	0	3
12	0	8
13	4	15
14	0	6
15	0	0

* Lost to monitor records; † no interview obtained.

compared with the monitor reading (table 3), and 11 patients reported tailoring the doses to lifestyle events such as meal or sleep times. While the inaccuracy of the interview technique was highlighted, discussion with patients may be valuable in determining the most convenient times for medication. In this way, the ophthalmologist may be able to assist the patient to minimise lifestyle disruption, thereby facilitating compliance.

Rotchford and Murphy found that 24% of 86 patients admitted to omitting their glaucoma treatment either frequently or occasionally.[15] Patients who always took their eye drops were significantly more likely to regard their drops as being 'vital' to their treatment as opposed to 'important'. The 13 patients registered as blind or partially sighted reported never missing a dose.

Physical inability to administer drops to the eye may have a role in visual loss that is additive to other aspects of non-compliance.[16] Winfield *et al.* performed a study to elucidate the physical difficulties experienced by 200 patients during eye drop administration.[12] 57% of patients had some difficulty administering their drops with 21% always needing assistance. Fear of the dropper touching the eye resulted in patients holding the dropper too far away, making

Table 4. Problems encountered during self-administration of eyedrops[12]

Problem	Patients (%)
Directing the bottle	
miss frequently	36
miss occasionally	13
Shaky hand	8
Difficulty squeezing the bottle	20
Blinking	12
Poor visibility of dropper tip	13
Inadvertently inserting dropper tip into eye	9
Reading labels and identifying medication	14

the aim difficult and encouraging the blink reflex (table 4). Older patients, particularly those with arthritic conditions, had difficulty in physically administering eye drops. Interestingly, since patients were reluctant to discuss these difficulties with their doctors, the medical staff involved in their care were largely unaware of the problems associated with eye drop administration. Dyscompliance is even less recognised than non-compliance.

Complex regimens are suspected to be a cause of non-compliance in terms of both number of medications and number of daily doses. Since glaucoma patients are often prescribed multiple medications and may have concomitant therapy for other chronic diseases, they may be at high risk for non-compliance.

Strategies for Improving Compliance

A major factor in the medical management of glaucoma is the extent to which patients comply with the treatment regimen.[10,17] Progression of the disease often leads to more potent drugs being given, which may be inappropriate if the progression is due to non-compliance rather than to treatment failure.[14,17] In addition, necessary glaucoma surgery may be postponed if non-compliant patients have a low IOP at clinic visits as a result of taking the medication only during the preceding hours.[14]

Strategies to improve compliance include educating patients about the disease and its treatment combined with tailoring the therapeutic regimen to the patient's lifestyle.[17] Patient education measures may take the form of videos, booklets, drug schedule diaries, and nurse education, with review and reinforcement at clinic visits. It is also important to work with patients to ensure that eye drops are correctly administered.

The usefulness of a 6-minute videotape in educating 98 patients with glaucoma about their disease was evaluated by Rosenthal *et al.*[18] A questionnaire, used to determine how much patients remembered from the video, showed that patients knowledge was significantly improved immediately after viewing ($p < 0.001$). After 6 months, patients with glaucoma retained more knowledge of the disease than did the controls who did not have glaucoma, although there was a significant drop in knowledge from immediately after viewing ($p < 0.001$). Patients responded positively to seeing the film and were grateful for the opportunity to view the tape. Provision of an accompanying brochure for the patient to take home may help to solve the problem of recall after time.

Streamlining a regimen to the patient's lifestyle is important to improve compliance, and once- or twice-daily medication interrupts patients' lifestyles far less than more frequent dosing.[17] Tailoring a medication to lifestyle requires investigation of patients' routines such as sleeping and eating patterns and work routines, and selecting a medication that will work well with these regular habits.[17]

Studies comparing fixed combination dorzolamide and timolol with timolol plus pilocarpine given concomitantly found that patients preferred the combination by a ratio of 4 to 1 ($p < 0.001$).[11] One of the main reasons given was that the combination interfered significantly less with daily life in

terms of activity limitations and side effects. Compliance was also significantly better with the combination.

Similarly, Schenker *et al.* found that significantly more patients (71%) preferred timolol gel once daily to timolol solution twice daily ($p < 0.001$), with 92% giving the once-daily dosing regimen as the reason for their preference.[19] Patients also reported significantly fewer missed doses while using timolol gel ($p = 0.005$), suggesting that, when appropriate, patients appreciate having their therapy simplified.

Latanoprost has a once-daily dosing schedule and has been shown to decrease IOP as much or greater than other glaucoma medications.[20] This agent, therefore, may be substituted for one or more glaucoma drugs to simplify the dosing schedule. Smith *et al.* found that 43 of 61 patients (70.4%) effectively simplified their daily medication without an adverse effect on IOP by switching to latanoprost (table 5).[21] These researchers concluded that latanoprost may be used to simplify the regimen for glaucoma patients by reducing the number of doses per day while maintaining an appropriate IOP level.

Other measures to improve compliance include more complete labelling of medicines, increased supervision and counselling, medication calendars, and reduction of medication-induced side effects.[6] The use of different sizes or shapes of medications and their containers will help patients to discriminate between different treatments[8] and obtaining help from a family member may improve compliance.[17]

Table 5. Number of patients and daily glaucoma medication doses before and after switching to latanoprost (n = 43)[21]

Number of daily medication doses	Number of patients: Baseline visit	Number of patients: After switching to latanoprost *
10	1	0
9	3	0
8	5	0
7	1	0
6	4	2
5	9	0
4	5	2
3	4	5
2	11	4
1	0	30

* $p < 0.001$ *vs* baseline

In Conclusion

There are a number of reasons for poor compliance with glaucoma medications, including lack of understanding of the disease, no obvious symptoms, complicated or too frequent drug schedules, side effects, physical difficulty in administering eye drops, and cost. Simplification of the treatment regimen and interactive health education appear to be the most important factors for improving compliance.[5] In addition, modifying the treatment regimen to fit with a patient's lifestyle may promote compliance by diminishing adverse effects while achieving maximal benefit.[9]

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Excimer Laser Photorefractive Keratectomy in Hyperopia

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Purpose: *To evaluate excimer laser photorefractive keratectomy for the treatment of different degrees of hyperopia.*
Patients and Methods: *Hyperopic photorefractive keratectomy was performed for 98 eyes of 52 patients at the Ophthalmology Centre, St. Petersburg, Russia. Patients were included in 1 of 4 groups according to initial refraction — group A (+ 1.00 D to + 2.75 D); group B (+ 3.00 D to + 4.75 D); group C (+ 5.00 D to + 5.75 D); and group D (≥ + 6.00 D). All eyes underwent photorefractive keratectomy using 5.5 mm ablation and 9.0 mm transition zones.*
Results: *12 months after photorefractive keratectomy, 100% of eyes in group A, 63.6% in group B, 41.7% in group C, and 40.0% in group D were within ± 1.00 diopters of emmetropia. Uncorrected visual acuity was 20/40 or better in 94.3%, 80.5%, 86.7%, and 62.6% of eyes for groups A, B, C, and D, respectively. No eyes in group A lost more than 1 line of best corrected visual acuity, although 8 eyes (22.9%) in group B, 7 (53.8%) in group C, and 6 (40.0%) in group D lost 2 or more lines of best corrected visual acuity.*
Conclusion: *Excimer laser photorefractive keratectomy was predictable and safe for the treatment of low and moderate hyperopia (1.00 - 4.00 diopters).*

Key Words: complications, hyperopia, management, photorefractive keratectomy, stability.

Asian Journal of Ophthalmology 2000;2(4):7-10.

Introduction

There are several surgical techniques for correction of hyperopia. These include holmium laser thermokeratoplasty, automated lamellar keratoplasty (ALK), LASIK, clear lens extraction, and posterior chamber phakic lens implantation. Laser correction of hyperopia involves change of the anterior corneal curvature by steepening the central optical zone. This is achieved by flattening the peripheral cornea through laser ablation.

The surgical correction of hyperopia remains a challenge. However, most of the published literature shows that hyperopic photorefraction keratectomy (H–PRK) is a relatively safe and effective treatment for the correction of low degrees of hyperopia up to 4.00 diopters (D).[1-6] This article reports our retrospective results of 98 eyes undergoing H-PRK.

Patients and Methods

Patient Selection

This study comprised 98 eyes of 52 patients undergoing PRK. 50.9% of patients were men, 49.1% were women, and the mean age was 48.6 ± 8.5 years. Patients who had herpes keratitis, superficial corneal pathology, significant refracting media alterations, keratoconus, or collagen diseases were excluded.

The risks and benefits of PRK and the therapeutic alternatives were explained to patients before their consent was obtained. For group D patients, the possibility of undercorrection was explained and agreed to since deeper ablation may cause unexpected side effects and full correction was not attempted for these patients.

Pre-operative Refraction and Intended Correction

Patients were divided into 4 groups according to the pre-operative spherical equivalent of hyperopia:

- group A — 1.00 D to 2.75 D (mean, 2.00 D; 35 eyes [35.7%])
- group B — 3.00 D to 4.75 D (mean, 3.70 D; 35 eyes [35.7%])
- group C — 5.00 D to 5.75 D (mean, 5.47 D; 15 eyes [15.3%])
- group D — ≥ 6.00 D (mean, 6.88 D; 13 eyes [13.3%]).

Ablation was performed according to the cycloplegic refraction, even if the difference between cycloplegic and manifest refractions exceeded 1.00 D. Usually, ablation did not exceed 6.00 D in patients with a high degree of hyperopia. Each patient was asked to evaluate his/her satisfaction on a scale of 1 to 5, 12 months after PRK.

Procedure and Postoperative Management

PRK was performed with the Excimer Laser Corneal System NIDEK EC 5000 (Nidek

Technologies Inc., Tokyo, Japan). After a 9 mm diameter section of the epithelium was removed with a spatula, ablation was performed at a repetition rate of 34 Hz, energy 180 mJ/cm^2, ablation depth 0.6 mm/pulse in the optical zone, and 0.4 mm/pulse in the transition zone. The 5.5 mm optical and 9.0 mm transition zones were used. Topical tobramycin 0.3%, naklof 0.1%, and solcoseril eye gel were prescribed 4 times a day for the epithelialisation period. Topical dexamethasone 0.1% was administered 3 to 4 times a day for 3 to 6 months with gradual dosage reduction, depending on the degree of hyperopia. The mean follow-up period was 8.9 months (range, 2 to 14 months). The first postoperative examination was performed after 4 days, and thereafter monthly for 6 to 12 months.

Visual Acuity and Refraction

Uncorrected and best corrected visual acuity (UCVA and BCVA) and manifest refraction were measured after 3 weeks and monthly thereafter.

Subepithelial Haze

Subepithelial haze formation was examined with a slit lamp and graded as follows:

- 0 — clear cornea
- 1+ — trace, barely perceptible haze
- 2+ — mild haze that does not affect refraction
- 3+ — moderate haze, refraction affected
- 4+ — anterior chamber easily viewed, opacity prevents refraction
- 5+ — totally opaque scar, anterior chamber not visible.

Intraocular Pressure

Intraocular pressure was measured pre- and postoperatively with non-contact tonometer NT-1000, (Nidek Technologies Inc., Tokyo, Japan).

Table 1. Time course of uncorrected and best corrected visual acuity (UCVA and BCVA) and correction

Hyperopia group	Mean ± SD			Number of eyes
	UCVA	BCVA	Correction (D)	
A (1.00 – 2.75 D)				
Pre-operative	0.24 ± 0.13	0.99 ± 0.06	2.00 ± 0.39	35
Postoperative:				
1 month	0.66 ± 0.27	0.94 ± 0.12	-0.43 ± 0.79	35
3 months	0.84 ± 0.21	0.97 ± 0.07	-0.18 ± 0.49	33
6 months	0.89 ± 0.17	0.99 ± 0.03	0.16 ± 0.59	17
12 months	0.94 ± 0.12	1.00 ± 0.06	0.31 ± 0.66	24
B (3.00 – 4.75 D)				
Pre-operative	0.13 ± 0.11	0.96 ± 0.11	3.70 ± 0.61	35
Postoperative:				
1 month	0.54 ± 0.26	0.77 ± 0.19	-0.56 ± 0.98	35
3 months	0.71 ± 0.26	0.90 ± 0.17	0.01 ± 0.80	32
6 months	0.67 ± 0.26	0.87 ± 0.19	0.56 ± 0.92	20
12 months	0.79 ± 0.25	0.91 ± 0.17	0.76 ± 0.88	18
C (5.00 – 5.75 D)				
Pre-operative	0.08 ± 0.05	0.90 ± 0.11	5.47 ± 0.66	15
Postoperative:				
1 month	0.44 ± 0.22	0.76 ± 0.16	-0.57 ± 1.59	15
3 months	0.67 ± 0.16	0.81 ± 0.16	0.31 ± 0.98	15
6 months	0.56 ± 0.21	0.79 ± 0.15	1.15 ± 1.20	10
12 months	0.44 ± 0.18	0.76 ± 0.18	1.19 ± 1.57	9
D (≥ 6.00 D)				
Pre-operative	0.05 ± 0.02	0.72 ± 0.35	6.88 ± 0.97	13
Postoperative:				
1 month	0.39 ± 0.18	0.54 ± 0.20	-0.45 ± 1.58	13
3 months	0.61 ± 0.24	0.64 ± 0.23	0.35 ± 1.26	13
6 months	0.43 ± 0.23	0.59 ± 0.25	1.08 ± 0.73	6
12 months	0.43 ± 0.15	0.55 ± 0.10	1.78 ± 1.19	4

Results

At the final examination, all patients had significant improvement in UCVA and stopped wearing glasses for long-distance. The overwhelming majority (96%) were satisfied with the operation results.

Visual Acuity

For patients in group A, UCVA of 20/40 was achieved for 33 of 35 eyes (94.3%) at 3 months, for 21 of 22 eyes (95.5%) at 7 to 9 months, and for 19 of 19 eyes (100%) at 1 year (table 1). For patients in group B, the same UCVA was achieved for 28 of 35 eyes (80%), in group C for 13 of 15 eyes (86.7%), and in group D for 8 of 13 eyes (61.5%). BCVA was maintained at 1 year for all group A eyes except for 1 eye that lost 1 line. At 12 months, there were no patients in group A who lost more than 1 line of BCVA. However, 8 patients (22.9%) in group B, 7 (53.8%) in group C, and 6 (40.0%) in group D lost 2 or more lines of BCVA. The most significant loss of BCVA was 4 lines determined for 3 eyes; 2 were in group C, and 1 in group D.

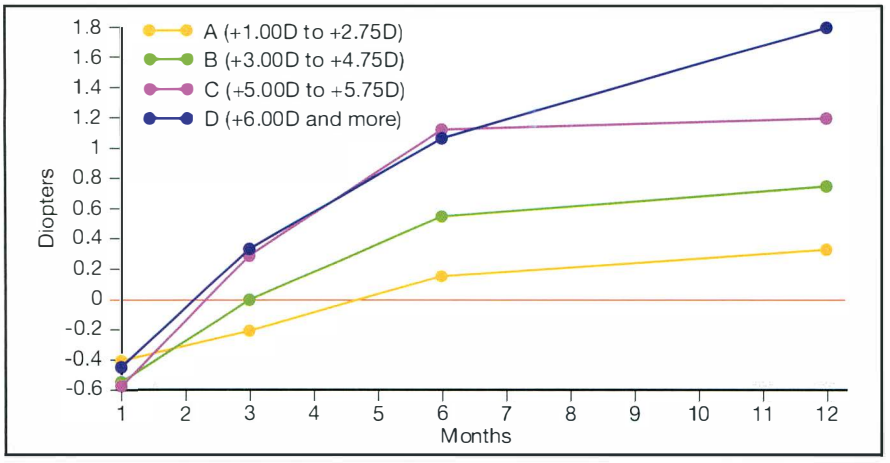
Predictability

The mean mild myopic refraction in all groups was revealed 1 month after surgery (figure 1), and there was a common tendency towards overcorrection. At 3 months, undercorrection was revealed in all groups except group A. 12 months after photorefractive keratectomy, 100% of patients in group A, 63.6% in group B, 41.7% in group C, and 40.0% in group D were within ± 1.00 diopters of emmetropia.

Stability

On average, a low degree of overcorrection for group A and a low degree of undercorrection in groups B, C, and D were revealed 3 months after surgery. Manifest and cycloplegic refraction was stable 4 months after surgery for group A, and at

Figure 1. **Evolution of refraction after photorefraction keratectomy over time**



7 to 8 months for group B. In groups C and D, there were no stable results and the regression was appreciable.

Complications

Decentration

Tangential topographic maps were used after excimer laser photorefractive keratectomy to evaluate treatment displacement and movement during treatment (drift). Decentration (area of the central steepening shifting more than 1.0 mm in relation to the optical axis) occurred in 4 eyes (4.1%). Three were from group D, and one was from group C and all were complicated with a ring-shaped subepithelial haze. Decentered treatments generally led to loss of lines of BCVA. Three eyes lost 3 lines and 1 lost 4 lines. Thus, topographic maps showed a typical 'keyhole' pattern.

Irregular Astigmatism

Irregular astigmatism was caused by decentration of the treatment. However, both eyes of 1 patient from group D had irregular astigmatism caused by an apical nodular subepithelial corneal scar, which developed within the first month after H-PRK and did not resolve spontaneously over time. This patient lost 3 and 4 lines of BCVA in the right and left eyes, respectively.

Subepithelial Haze

Generally, the ring-shaped subepithelial haze had a diameter of 5.5 to 6.0 mm. Subepithelial haze formation was verified in 20 of 55 eyes (36.3%) examined 12 months after surgery and was less than 2+ in all except 4 eyes. Two from group C and 2 from group D had a 3+ haze. One eye from group C had 2+ haze formation.

Re-epithelialisation

Re-epithelialisation was complete within 4 days of surgery in 83 eyes (84.7%) — 31 eyes (88.6%) in group A, 29 (82.9%) in group B, 14 (93.3%) in group C, and 9 (69.2%) in group D. In these eyes, postoperative erosion was not revealed after 1 week.

Intraocular Pressure

Intraocular pressure increased in 24 eyes of 16 patients (24.5%). After topical steroid was discontinued, intraocular pressure decreased to normal levels. For some patients with a moderate or high degree of hyperopia, β-blockers were administered when steroids could not be withdrawn.

Patient Satisfaction

Overall, 96.7% of patients were happy that they had undergone this operation. The majority (76.7%) were very happy and rated the procedure 5/5. There was only 1 patient with a severe hyperopia who felt unhappy with the final outcome of the procedure and rated it 3/5. This patient had an apical nodular subepithelial corneal scar. After PRK, he had a final unaided vision of 0.3 and had lost 3 lines of BCVA in both eyes. Thus, the average score was 4.8.

Discussion

Hyperopia is the most frequent refractive error. However, hyperopic patients rarely turn to refractive centres for help. The main reason is that people with mild and moderate hyperopia consider short distance deterioration of vision to be a normal age-related process. Another reason is that the affected population has not recognised a predictable and safe method of correcting hyperopia. Numerous methods have been used to treat hyperopia, but their results have been variable and not always satisfactory.

Thermokeratoplasty is recognised as a procedure with a high regression rate and the achieved correction is relatively mild. Other methods such as clear lens extraction with intraocular lens implantation and ALK carry significant complications.

In this research, of the 53 patients examined 6 months after PRK, 83.7% had refraction within ± 1.00 D and 68.4% within ± 0.50 D. During the first 2 to 4 months after surgery, there was typical overcorrection, although refraction moved towards emmetropia and undercorrection. The most significant range in postoperative refraction was in groups C and D, in whom refraction remained unstable up to 1 year after surgery. It is interesting that there was noticeable improvement in refraction after an additional steroid course was prescribed.

Conclusion

PRK is a predictable and safe method for correction of hyperopia of less than 4.00 D.[1,2,5,6] Of 11 eyes in group B, 5 lost 1 or

more Snellen lines, all of whom had pre-operative refraction of > 4.00 D. Groups C and D had the highest incidence of decreased BCVA. The main reason was irregular astigmatism caused by decentration of the treatment and different subepithelial formations.[7,8]

This study demonstrates a very high level of patient satisfaction after PRK. The vast majority of patients were satisfied with the procedure (96.7%); only 1 of 9 patients (15.0%) with decreased BCVA had any complaint.

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Blindness in Asia — the Facts

The number of blind people in the world is not accurately known, but has been estimated by the World Health Organization (WHO) to be approximately 38 million.[1] A further 110 million people have low vision and are at risk of becoming blind. The main causes of blindness and low vision are cataract, trachoma, glaucoma, onchocerciasis, and xerophthalmia.

When the WHO Programme for the Prevention of Blindness was established in 1978, its priority was to obtain more detailed information about blindness worldwide. A Task Force on Data on Blindness was convened and an epidemiological model for population-based blindness estimates was established. In 1993, the WHO, in conjunction with the World Bank, undertook to measure the burden of blindness. The global burden of disease combines premature loss of life with the loss of healthy life years from disability, and is measured in units of disability-adjusted life years (DALYs).

Global Burden of Blindness

The 229 countries and territories worldwide were grouped into 8 economic regions (as shown in table 1), and the demographic structure was taken as the population base, by country and for defined age groups.

In 1990, there were approximately 38 million blind people in the world, with a global prevalence of 0.7% (range 0.3 to 1.4%; table 2). Surveys in 17 countries showed the estimated prevalence of low vision to be approximately 110 million. Therefore, the total burden of visual impairment (people blind or with significant visual loss) was estimated at 148 million.

The regional burden of blindness (RBB) relates to the proportion of the number of blind in a particular region to the global number of blind people, and the proportion of the regional population to the world population. Every RBB ratio greater than unity (1.00) identifies those regions where the burden of blindness is to be taken into consideration in terms of setting up priorities on a global scale. Sub-Saharan Africa, India, and 'other Asian countries and islands' have RBB ratios greater than 1.00 (table 3).

22 million blind people (58% of the global blind population) are aged ≥ 60 years, while only 3.8% (approximately 1.5 million) of children aged ≤ 4 years old are blind. Developing countries, with 58.5% of the global population aged > 60 years, have 88.8% of the blindness in this age group (RBB = 1.51).

The 3 main causes of blindness in the world are cataract, trachoma, and glaucoma, which together account for more than two-thirds of the world's blindness. Cataract is the most important cause of blindness in developing countries, causing 41.8% of global blindness (table 4), while other causes such as diabetic retinopathy or macular degeneration dominate in the established market economies.

These estimates indicate that the prevalence of blindness will increase unless sufficient resources for its prevention are

Table 1. Distribution of countries according to economic region

Region	Number of countries	Population (x 10^3)
Established market economies*	35	797,788
Former socialist economies of Europe	14	346,237
India	1	849,515
China	1	1,133,698
Other Asian countries and islands	49	682,533
Sub-Saharan Africa	49	510,271
Latin America and the Caribbean	46	444,297
Middle-Eastern Crescent†	34	503,075
Total	**229**	**5,267,075**

* Western Europe, North America, Australia, Japan, and New Zealand. † Plus newly independent states in Central Asia.

Table 2. Global distribution of blindness

Region	Reference population (x 10^3)	Number of blind (x 10^3)	Prevalence of blindness (%)
Established market economies*	797,788	2,400	0.3
Former socialist economies of Europe	346,237	1,100	0.3
India	849,515	8,900	1.0
China	1,133,698	6,700	0.6
Other Asian countries and islands	682,533	5,800	0.8
Sub-Saharan Africa	510,271	7,100	1.4
Latin America and the Caribbean	444,297	2,300	0.5
Middle-Eastern Crescent†	503,075	3,600	0.7
Total	**5,267,075**	**37,900**	**0.7**

* Western Europe, North America, Australia, Japan, and New Zealand. † Plus newly independent states in Central Asia.

Table 3. Regional burden of blindness (RBB)

Region	% of global population (A)	% of global blindness burden (B)	RBB (B/A)
Established market economies*	15.1	6.3	0.41
Former socialist economies of Europe	6.6	2.9	0.44
India	16.1	23.5	1.46
China	21.4	17.6	0.82
Other Asian countries and islands	13.0	15.3	1.18
Sub-Saharan Africa	9.7	18.8	1.93
Latin America and the Caribbean	8.4	6.1	0.72
Middle-Eastern Crescent†	9.6	9.5	0.99

* Western Europe, North America, Australia, Japan, and New Zealand. † Plus newly independent states in Central Asia.

Table 4. Global distribution of blindness by cause and by region

Region	Number of blind (x 10^3)				
	Cataract	Trachoma	Glaucoma	Onchocerciasis	Other
Established market economies*	84	—	180	—	2,136
Former socialist economies of Europe	91	—	74	—	935
India	5,120	865	1,141	—	1,774
China	2,166	1,174	1,514	—	1,846
Other Asian countries and islands	2,314	1,362	973	—	1,151
Sub-Saharan Africa	3,101	1,380	853	358.5	1,407.5
Latin America and the Caribbean	1,326	158	183	1.5	631.1
Middle-Eastern Crescent†	1,627	927	205	—	841
Total (%)	**15,820 (41.8)**	**5,866 (15.5)**	**5,123 (13.5)**	**360 (0.9)**	**10,722 (283)**

* Western Europe, North America, Australia, Japan, and New Zealand. † Plus newly independent states in Central Asia.

made available. This increase is, however, occurring almost exclusively in Africa and Asia, where 75% of the world's blindness occurs. The high population growth and increasingly elderly populations in these areas contribute to the upward trend.

While more information about low vision is required, available data indicate that there are 3 people with low vision for every blind person, a situation that has great socio-economic and public health significance. Further data on low vision and its causes will allow for proper national programme planning.

Blindness in Asia

China

In 1995, the population of China was estimated to be 1200 million people, of whom 100 million were aged more than 60 years.[2] An estimated 5 million people (0.4% of the population) are blind. A survey conducted in 1988 found that more than 40% of all blindness is due to cataract, 25% was due to corneal scarring and/or trachoma, while 10% was due to glaucoma.

There are approximately 15,000 eye doctors in China, of whom 20% are surgically trained and regularly perform cataract surgery. There is therefore approximately one eye doctor per 80,000 population and one ophthalmologist per 400,000 people.

In 1994, approximately 150,000 cataract operations were performed in China, giving an overall cataract surgical rate (CSR) of 130 cataract operations per million population per year. However, the range varies between different provinces from 65 to 450 cataract operations per million people per year. The rate is higher in the larger cities and lower in rural areas.

Population based studies in 2 counties in China, performed in 1995, show the prevalence of bilateral blindness in Doumen and Shunyi to be 2.6% and 1.9%, respectively, with a cataract surgical coverage of 30% and 40%, respectively.[3] These figures indicate that the prevalence of blindness in China has probably slightly decreased during the previous 10 years. However, the cataract surgical coverage is still unsatisfactory.

Thailand

Blindness surveys in Thailand performed between 1983 and 1994 show an overall reduction in the prevalence of blindness of more than 70% (figure 1). The programme for the prevention of blindness in Thailand has been successful, and the country now has 92 eye units in the 72 provinces. There are more than 300 ophthalmologists, with 124 working in the government sector. More than 60,000 cataract operations are

Figure 1. Prevalence of blindness/cataract blindness in Thailand between 1983 and 1994.

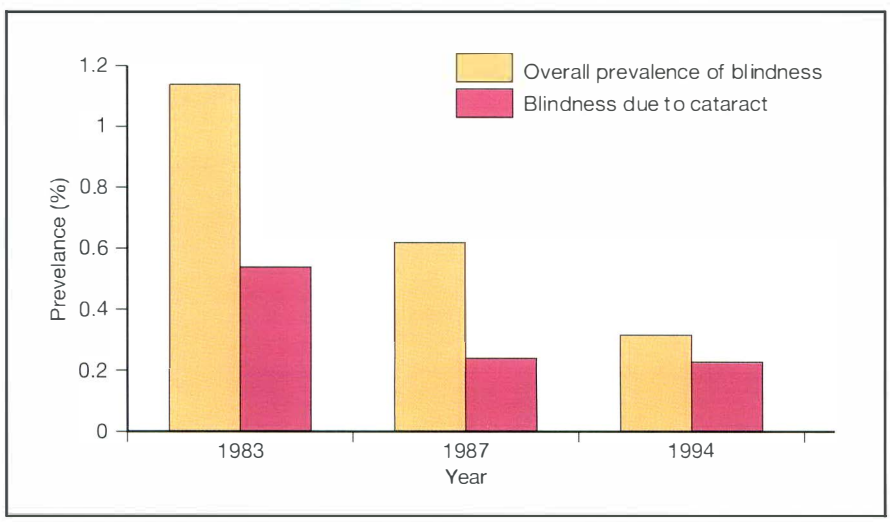

Table 5. **Age-specific prevalence of blindness (< 6/60)**

Place	Age group (years)		
	50 - 59	60 - 69	> 70
Doumen, China (n = 5759)	0.6%	1.2%	5.3%
Shunyi, China (n = 5555)	0.2%	1.7%	5.3%
Nepal (n = 5112)	1.3%	3.7%	10.6%

performed each year, and may be in excess of 100,000 if all private operations are included. Training in primary eye care has reached 50 of the 72 provinces.

India

The last national survey in India gave a blindness prevalence of 0.7%. A survey performed in Gujarat State in 1992 showed an overall decline in the prevalence of blindness and of cataract. However, a recent survey has shown an overall increase in the prevalence of blindness and cataract since 1986. The national CSR is approximately 2700 operations per million people per year. The CSR in Karnataka is similar to the national rate, while Gujarat has a high CSR of approximately 5000 operations. Studies from Karnataka suggest that fear of surgery and cost are important barriers to the delivery of cataract surgery.

Nepal

The prevalence of blindness in people older than 45 years is 3% in Nepal. Cataract is responsible for 78% of all blindness. The age-specific prevalence of blindness in Nepal is approximately twice that of China (table 5), although the cataract surgical coverage is similar if not higher.

Viet Nam

The population of Viet Nam is approximately 70 million, divided into 45 provinces. There are sufficient ophthalmologists (more than 400) although many surgeons have limited supplies and equipment. The goal of the cataract programme in Viet Nam was to increase surgical output. Approximately 50,000 surgeries are now performed each year (CSR 750) from an initial figure of 10,000 surgeries per year.

The Philippines

The prevalence of blindness is estimated at approximately 1% , with 60% being due to cataract. A training programme for ophthalmologists to work in rural and provincial areas has been running for some years with good results.

In Conclusion

Certain blinding diseases (most notably onchocerciasis and vitamin A deficiency) appear to be decreasing due to adequate control measures. However, the increasing ageing population is resulting in an increase in the prevalence of blindness due to cataract and glaucoma. There are often marked variations between different geographical areas, socio-economic groups, and age and gender in terms of prevalence of blindness and coverage by eye care services.

Rural communities tend to have a higher prevalence of blindness than urban societies, although eye care facilities tend to be better developed in cities than in rural areas. Overall, there has been a marked improvement in the number of eye surgeons and assistants trained to provide eye care. However, there is still a need to improve the availability of eye care staff in rural areas.

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This report has been written by a staff medical reporter using information provided by the World Health Organization.

Sight Savers International — Saving Sight, Changing Lives

"People don't go blind by the million. Each of them, as a human being, goes blind as a personal tragedy" — Sir John Wilson, Founder of Sight Savers International.

Sight Savers International is the UK's leading charity for the prevention and cure of blindness in developing countries, bringing hope to people who would otherwise never see again. Sight Savers International has restored sight to more than 4 million people and treated 45 million for potentially blinding conditions in more than 20 of the world's poorest countries. The programmes are developed in collaboration with local partners with the aim of establishing sustainable services targeting the most vulnerable communities.

During the past 50 years, Sight Savers International has helped to pioneer the introduction of integrated education, allowing blind children to attend mainstream schools; established a comprehensive eye care model, providing entire districts with a complete range of eye care services; and established the production of low cost equipment (intraocular lenses [IOLs], sutures, etc) in developing countries, enabling low cost cataract procedures to be performed.

The Pakistan Institute of Community Ophthalmology

In conjunction with Sight Savers International, the PICO is developing a range of programmes aimed at bringing eye care within the reach of the largely rural population of the NWFP. Three of the Institute's projects are currently funded by Sight Savers International:

- Ophthalmic Technicians Course — ophthalmic paramedics are able to provide care for a large proportion of patients with visual disability, freeing up time for the ophthalmologists to work with patients with more severe conditions. More than 100 ophthalmic technicians have already been trained, and are qualified to run eye clinics and sight testing programmes, as well as making surgical referrals and assisting in the operating theatre.
- MSc in Community Ophthalmology — offering training in the development of prevention programmes which reach out into the community as well as clinical treatment for blinding conditions. Activities include eye screening programmes, eye health education, and early intervention programmes for children. The course will train at least 6 ophthalmologists per year, and is based on the curriculum of the International Centre for Eye Health (ICEH) in London, UK.
- Comprehensive Eye Care Projects — development of a comprehensive eye care programme to make services available at the community level. A pilot comprehensive eye care project has been successful in reaching most sectors of the population in Bannu district and new programmes are being developed to serve the more remote regions of the NWFP.

Sight Savers International in Asia

Sight Savers International's presence in Asia focuses on India, Pakistan, Bangladesh, and Sri Lanka. Work in India began in 1966, in partnership with local organisations. During that time, 3 million cataract operations have been performed and more than 20 million eye patients treated.

Although Sight Savers International supports projects in most Indian states, the emphasis for expansion is currently in the poorer states of Rajasthan, Madhya Pradesh, Uttar Pradesh, Orissa, and Bihar in the north of the country.

Sight Savers International works with more than 75 partner organisations in India, ranging from small community groups to world class eye institutions. Projects include primary eye care training, community-based rehabilitation, and clinical care. Sight Savers International is helping to develop the major institutions as national resource centres for training and low-cost product development such as intraocular lenses and sutures. Increasingly, as eye hospitals develop in all the Indian states, the most successful are also functioning as resource centres for smaller partners in each region.

Since 1985, Sight Savers International has worked with 3 major partners in Pakistan

— the Layton Rahmatulla Benevolent Trust, the Pakistan Institute of Community Ophthalmology (PICO) in Peshawar, and the Al-Shifa Trust Eye Hospital in Rawalpindi. The programmes aim to develop eye care services for the poorest people in both urban and rural areas, providing preventive care as well as a full range of eye care services.

The World Health Organization (WHO) estimates that more than 1% of the population in Pakistan is blind. The North-West Frontier Province (NWFP) is the current focus for Sight Savers International's work in Pakistan, where the number of blind people is estimated to be 160,000.

Six field hospitals in areas that previously had no eye care have been established and are running with the support of Sight Savers International. These hospitals serve some of the poorest people in both urban and rural areas, and are supervised by base hospitals in Karachi and Lahore. Korangi Hospital in Karachi also provides treatment for more serious conditions referred from the field hospitals and runs a training centre for ophthalmic personnel and a school eye screening service. During the next few years, the focus of the partnership in Pakistan will be on preventive eye care services.

The WHO has estimated that there are more than 1.2 million blind people in Bangladesh, more than 90% of whom have curable or preventable blindness. However, most of Bangladesh's eye care facilities are based in the cities, while more than 80% of the population live in rural areas. Sight Savers International, in conjunction with Bangladeshi partners, has largely concentrated on bringing eye care within the reach of the poor communities and, for the past 15 years, has helped to develop services for incurably blind people. Comprehensive eye services projects are based at Comilla, Ulipur, Sirjganj, Bogra, and Cox's Bazar, and offer permanent, year-round services for the entire population of the district.

The ultimate aim of the comprehensive eye services is to treat the backlog of patients requiring cataract surgery and to be in a position to treat all new patients with cataract blindness. The number of cataract surgeries has increased significantly since the projects were launched in 1994 to more than 15,000 per year.

The core of each comprehensive eye service programme is the base hospital, located centrally within the programme command area. The base hospital acts as a nerve centre for programme control as well as being the primary centre for medical service delivery. The comprehensive eye services programmes also deliver primary eye care and screening systems to people living in the project area.

Each comprehensive eye service owns a vehicle which transports the eye care teams and brings patients to the base hospital for surgery — an important service for communities where people cannot afford to travel by public transport.

In 1999, Sight Savers International set up its first pilot programme in partnership with the government of Bangladesh at Gopalganj in the south of the country. Only through working together can the government and organisations such as Sight Savers International hope to operate on the backlog of more than 500,000 people requiring cataract surgery. It is hoped that the Gopalganj project will help to show how eye care services can be delivered effectively within a government structure.

In order to find out more about the work of the organisation, Asian Journal of OPHTHALMOLOGY met with Wilma Van Berkel and Debbie Sagar at the Sight Savers International headquarters in the UK.

An Interview With ...

Wilma Van Berkel
India Programme Officer

Debbie Sagar
Programme Officer South Asia and Caribbean

Sight Savers International
Royal Commonwealth Society for the Blind
Haywards Heath, UK

***Q:** What was the rationale for founding Sight Savers International?*

Ms Van Berkel: The charity was founded in 1950 by Sir John Wilson when he became involved in research into the high incidence of river blindness in West Africa. As a result, what was then known as the British Empire Society for the Blind was formed as an offshoot from the Royal National Institute for the Blind in the UK, with a remit to work in Commonwealth countries. Since that time, our policies and approaches have evolved tremendously. We are now known as Sight Savers International. In Asia, the organisation may still be recognised as the Royal Commonwealth Society for the Blind.

Sight Savers International is currently working in 29 countries throughout the developing world, primarily, but not exclusively, in Commonwealth countries. We work across all the areas of eye care and services for blind people. Community

Bhabani Mishra, aged 70, is overcome with emotion when she returns to her village in Midnapore, India, with her daughter-in-law (left), able to see again after years of blindness.

eye health, as it is now becoming known, includes prevention, clinical care, and services for people who are irreversibly blind.

***Q:** Which geographical areas do you cover?*

Ms Sagar: The world is essentially divided into 4 areas for the purposes of Sight Savers International's work: India, West Africa, East Africa, and South Asia and the Caribbean. I cover South Asia and the Caribbean, which includes Bangladesh, Pakistan, and Sri Lanka. The regional office is based in the UK and there are country offices in Bangladesh and Pakistan, with direct responsibility for the day to day running of relationships with the partners with which we work, and for development of the programmes. I have an interactive role with the partners and work closely with the partners and country offices on programme development.

Ms Van Berkel: My role as a programme officer for India relates to liaison and communication with the regional office in India. The programmes are developed by the local Sight Savers International programme staff in India, who work with local partner organisations. Sight Savers International has permanent staffing in India, and the support structure allows us to work closely with the partner organisations and to build on these relationships. The introduction of Vision 2020: The Right to Sight, a global coalition of NGO's and the WHO to eradicate avoidable blindness by the year 2020, has been helpful to us. This initiative will enable comprehensive assessment of the needs of an area and how best to meet these needs.

***Q:** What is the blindness picture in India and South Asia and how do you ascertain the needs of the country?*

Ms Van Berkel: We are looking for the areas of greatest need that are least served. These areas tend to be rural, but we are also involved in a few urban programmes. We aim to help particularly vulnerable members of the community, for example tribal groups and people with leprosy.

While India does have a relatively high level of ophthalmologists and clinical services, the main problem is how those services are distributed, and primary eye care and prevention of blindness is often neglected. Broadly speaking, South India is generally better served — some of the larger eye care institutions have had a very positive influence. Our focus, therefore, is mainly in the northern states of Rajasthan, Madhya Pradesh, Uttar Pradesh, Orissa, and Bihar.

One of the unique points about India is that there is a vibrant voluntary sector, and a real interest in community involvement and support, so there is a wealth of partner organisations to work with.

Bankim Sahu from Midnapore, India, has been blind for many years, The smile on his face, when he sees for the first time after years of cataract blindness, says more than any words could express.

Ms Sagar: The situation in South Asia is somewhat different, in that although we do work with NGOs, we also work quite closely with the government, particularly in Pakistan, to strengthen eye services within the existing infrastructure.

The main problem in Pakistan is not with the number of clinical ophthalmologists, but with the distribution. Most ophthalmologists work in cities rather than rural areas, so one of the key priorities of our work is to support training for ophthalmology paramedics. This relieves ophthalmologists from the more routine activities and enables specialists to concentrate on surgical procedures and blinding conditions. Sight Savers International does support training of ophthalmologists in specialist areas, particularly to upgrade surgical skills and knowledge of sub-specialities such as diabetic retinopathy. The aim of training, therefore, is not to produce more ophthalmologists, but to equip the existing ophthalmologists with modern skills and support staff. The key points that hinder ophthalmologists from working to their full potential are lack of support staff such as paramedics, and insufficient equipment and infrastructure in the form of operating rooms.

We are currently working in collaboration with the PICO on a programme to equip 10 districts with government eye units, which will enable the ophthalmologists to work to their full potential. This includes providing paramedics, training, and equipment, and improving the infrastructure.

Ms Van Berkel: A key point about training is that, as we are working through partner organisations in each country, Sight Savers International is able to establish in-country training programmes. As we believe in establishing local capacity for the training, we help to establish a course, which will then be run by local people. Importantly, there is collaboration between the countries in the region. For example, we recently helped to establish a microsurgery course in Bangladesh in which the Faculty were trained in

India on courses previously established by Sight Savers International.

Courses are also run on an informal basis, whereby some of the larger comprehensive eye service programmes expand the capacity of their own hospitals by offering microsurgery training. This approach does not result in a formal qualification, but offers 'hands on' training while working. This type of training can be offered at regional hospitals, giving regional ophthalmologists the opportunity to update their skills.

Q: *Even if local hospitals are equipped to deal with surgery, patients still need to attend the hospital, which for many will be financially difficult. How do you address this problem?*

Ms Van Berkel: In India, we often provide vehicles to support outreach screening work, in addition to the provision of ophthalmic equipment.

Q: *What are some of the other problems you encounter in the various states?*

Ms Van Berkel: Delhi and its surrounding area of Haryana is more affluent than most other parts of the North, but the states that surround Haryana such as Rajasthan, Madhya Pradesh, Uttar Pradesh, and Bihar are poor and there is a great need for eye care services. Madhya Pradesh, particularly, is very poor. It is a large state, with a scattered tribal population living in inaccessible areas. Rajasthan is a sparsely populated desert area, with few ophthalmologists and continuing problems with drought. India is a complex country, with great differences between one state and another.

Q: *How do you allocate resources in this situation?*

Ms Van Berkel: We assess the needs of each area to decide where to focus the available resources, in conjunction with our partner organisations and other NGOs. There tends to be a concentration of NGO activity in the South, with less focus on the poorer northern states. For example, Uttar Pradesh is a very poor state, with a background of eye camps. Sight Savers International is aiming to improve on what is already in place with a more sustainable approach.

Q: *What is the role of the local partners?*

Ms Van Berkel: The local partners range from local women's groups through local community service groups such as Rotary Clubs, to religious foundations and world class eye institutions such as Aravind Eye Hospital and LV Prasad Eye Institute.

One of our partners is a large federation of community groups, which has health and education workers throughout the Thar desert. We are currently working together to establish permanent eye facilities and to provide primary eye care training in this area. Primary eye care and prevention of blindness are very important from the community point of view, so as not to over-stretch the resources for clinical care.

Q: *Is the work similar in the other countries in the sub-continent?*

Ms Sagar: In Bangladesh, Sight Savers International works with NGO partners, charitable organisations and eye care hospitals, so the spectrum of partners is similar to that of India although on a smaller scale. However, we are starting to work more closely with the government so as not to duplicate resources.

In Pakistan, we work with NGO partners focussing on support for community-based outreach work. The PICO has an interesting approach in which they have set up a MSc course in Community Ophthalmology, based on the course run by the International Centre for Eye Health (ICEH) in London, UK. This course emphasises the need to move from clinical eye care to community eye care in which the eye health needs of whole communities can be met. The course is open to ophthalmologists throughout the country, and the first graduates are now successfully raising the profile of community eye care in a number of provinces. Ophthalmologists graduate from the course with a new outlook on community eye care. There are many barriers to people accepting eye care services, such as lack of knowledge, financial difficulty, fear, and travel difficulties. Community eye health is about overcoming these barriers and aiming for early intervention.

Ms Van Berkel: Sight Savers International has supported the ICEH for some time, and also sponsors students from within supported programmes to attend the course. However, the aim is for the course to devolve out, so that it is available in countries that require this type of training. The course is aimed at ophthalmologists from developing countries and the faculty have extensive experience of working in these countries. Since it is not always economically viable for ophthalmologists to attend courses in London, it is therefore more practical for the training to be offered in their own countries.

Ms Sagar: Another benefit to the course being offered in, for instance, Pakistan is that students are required to produce a dissertation using the methodologies learned on the course. This means that more accurate epidemiological information is gathered at the community level, which is contained in a database, and used to address specific problems in the community.

Q: *What are the main causes of blindness in the areas in which you work?*

Ms Sagar: In the context of the Vision 2020 campaign, 5 diseases have been prioritised

Sight Savers International Mission Statement

Sight Savers International believes that:

- No one should needlessly lose the sense of sight
- Everyone has a right to access services that maintain, restore, or improve sight
- All blind and partially-sighted people have a right to access services which enhance their quality of life.

— cataract, trachoma, onchocerciasis, childhood blindness, and refraction and low vision. Onchocerciasis is not seen in Asia, and trachoma is only present in pockets in rural areas, so the 3 main WHO concerns in Asia are cataract, childhood blindness, and refraction/low vision.

However, a population-based survey in Pakistan showed that corneal scarring was a significant cause of blindness, and is often caused by untreated infection, highlighting the need for prevention and early treatment. The important factors are to ensure that treatment is available, people know about it and can access it easily, and that medicines are affordable. Where possible, Sight Savers International supports the development of facilities to produce high quality, low cost eye consumables.

There is some vitamin A deficiency in Pakistan, although the incidence is decreasing. Vitamin A is now being distributed in Pakistan with the poliomyelitis vaccination.

Sight Savers International has supported a comprehensive blindness survey in Bangladesh, with the results expected later this year. The intention is to provide data for planning eye service provision and capacity for more detailed research in future.

Ms Van Berkel: Cataract is the main cause of blindness in India. Cataract surgery is therefore a major emphasis and last year 115,000 free cataract surgeries were performed through programmes supported by Sight Savers International.

A growing problem in India is diabetes, particularly in the more affluent areas, so diabetic retinopathy is a problem. Sight Savers International is helping to establish a course for treating diabetic retinopathy. However, work is also needed to ensure that general practitioners and people with diabetes are aware of the ocular implications of the disease. Similarly, health workers caring for people with leprosy in India have only a limited knowledge about the link between leprosy and ocular disease, and education in these areas is required.

Q: *Can you tell us about the situation in Sri Lanka?*

Ms Sagar: The situation in Sri Lanka is a little better than in the other countries we have discussed. There are several eye units in the country and Sight Savers International has supported a number of programmes to upgrade them during the past 10 years. The situation has improved and a programme to train community health care workers in eye care is now in place. The number of referrals to hospital for cataract surgery has increased since the programme started, indicating that patients are motivated to seek treatment by these workers. Certainly, accessibility is not such an issue in Sri Lanka as the basic infrastructure is satisfactory.

Q: *What is your final message?*

Ms Sagar: The key point is that we are working in long-term partnerships to facilitate the creation of low cost eye care, and enable local people to continue the programmes without Sight Savers International's presence.

Ms Van Berkel: Another key point is that our approach is comprehensive, in terms of looking at the community and their eye health needs as a whole. This work is as important as how many surgeries are carried out, and will have the greatest impact in the long run.

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Abstracts of Asian research published in the international literature

Anterior Chamber Depth Measurement as a Screening Tool for PACG

A 2-phase, cross-sectional, community-based study was performed in Hovsgol and Omnogobi provinces, Mongolia, to evaluate anterior chamber depth measurement as a method of screening for primary angle-closure glaucoma (PACG) in an East Asian population. 942 individuals in Hovsgol and 775 individuals in Omnogobi aged 40 years or older were examined. Optical pachymetry outperformed the slit-lamp-mounted ultrasound method of anterior chamber depth measurement (area under the curve, 0.93 and 0.90, respectively; $p = 0.001$). Handheld ultrasound (area under the curve, 0.86) was inferior to optical measurement ($p = 0.001$) but did not differ significantly from slit-lamp ultrasound ($p = 0.06$). The optical method gave a sensitivity of 85% and a specificity of 84% at a screening cut-off of less than 2.22 mm for detecting occludable angles.

Measurement of the axial anterior chamber depth can detect occludable angles in this Asian population and therefore may have a role in population screening for PACG.

Devereux JG, Foster PJ, Baasanhu J, *et al*. Anterior chamber depth measurement as a screening tool for primary angle-closure glaucoma in an East Asian population. *Arch Ophthalmol* 2000;**118**:257-263.

Detection of Gonioscopically Occludable Angles and PACG by Limbal Chamber Depth

A 2-phase, cross sectional, community based study was conducted in Hovsgol and Omnogobi provinces, Mongolia, to evaluate the performance of limbal chamber depth estimation as a means of detecting occludable drainage angles and primary angle closure (PAC), with or without glaucoma, in an East Asian population, and to determine whether an augmented grading scheme would enhance test performance.

1717 subjects aged 40 to 93 years were examined. Depth of the anterior chamber at the temporal limbus was graded as a percentage fraction of peripheral corneal thickness. An 'occludable' angle was one in which the trabecular meshwork was seen in less than 90° of the angle circumference by gonioscopy. PAC was diagnosed in individuals with an occludable angle and either raised pressure or peripheral anterior synechiae. PAC with glaucoma (PACG) was diagnosed in individuals with an occludable angle combined with glaucomatous optic neuropathy and consistent visual morbidity.

Occludable angles were identified in 140 subjects, 28 of whom had PACG. The 15% grade (traditional 'grade 1') yielded sensitivity and specificity of 84% and 86%, respectively, for the detection of occludable angles. The 5% grade gave sensitivity of 91% and specificity of 93% for the detection of PACG. The interobserver agreement for this augmented grading scheme was good (weighted kappa 0.76).

The traditional limbal chamber depth grading scheme offers good performance for detecting occludable drainage angles in this population. The augmented scheme gives enhanced performance in detection of established PACG and has potential for good interobserver agreement.

Foster PJ, Devereux JG, Alsbirk PH, *et al*. Detection of gonioscopically occludable angles and primary angle closure glaucoma by estimation of limbal chamber depth in Asians: modified grading scheme. *Br J Ophthalmol* 2000;**84**:186-192.

Cost-effectiveness of Cataract Surgery in India

3.8 million people become blind due to cataracts every year in India. The cost-effectiveness of public-funded options for delivering cataract surgery in Mysore, India, was assessed by studying 3 types of delivery of cataract surgery:

- mobile government camps
- walk-in services at a state medical college hospital
- patients transported from satellite clinics to a non-governmental hospital.

Almost half the patients operated on in government camps were dissatisfied with the outcome (table 1). User satisfaction was higher with other providers and fewer patients remained blind.

Table 1. User satisfaction for 3 types of delivery of cataract surgery in India

Delivery method	% Satisfied	95% CI
Government camp*	51	36-61
Medical college hospital	82	63-94
Non-government hospital	85	72-93

* More than one-third of patients remained blind in the operated eye (25/70, 36%).

Camps were a low-cost option, but poor outcomes reduced their cost-effectiveness (US$97 per patient). The state medical college hospital was least cost-effective, at US$176 per patient, while the non-governmental hospital was the most cost-effective at US$54 per patient. These authors concluded that the government of India should review its policy for government camp surgery, and consider alternatives, such as transporting patients to permanent facilities. India and other developing countries should monitor outcomes in cataract surgery programmes, as well as throughput.

Singh AJ, Garner P, Floyd K. Cost-effectiveness of public-funded options for cataract surgery in Mysore, India. *Lancet* 2000;**355**:180-184.

CONGRESS CALENDAR

OCTOBER

4-7

The European Association for Vision and Eye Research
Palma de Mallorca, Spain
Contact: Secretariat EVER, Postbus 74 B-3000 Leuven Belgium
Fax: (32) 1633 6785

15-21

International Congress on Eye Research
Santa Fe, NM, USA
Contact: University of Louisville
Tel: (1 502) 852 5459
Fax: (1 502) 852 7450

22-25

2000 Annual American Academy of Ophthalmology Meeting
Dallas, TX, USA
Contact: American Academy of Ophthalmology
Tel: (1 415) 561 8500 ext.304
Fax: (1 415) 561 8576

NOVEMBER

3-5

LASIK for the General Ophthalmologist
Scottsdale, AZ, USA
Contact: Teri Rothenbach, Casebeer Educational Foundation
Tel: (1 480) 483 8847
Fax: (1 480) 483 1064

11-12

Hong Kong Ophthalmological Symposium 2000
Hong Kong, China
Contact: The Secretariat, Room 802, 8/F Hong Kong Academy of Medicine Jockey Club Building, 99 Wong Chuk Hang Road, Aberdeen, Hong Kong, China
Tel: (852) 2761 9128
Fax: (852) 2715 0089

11-15

12th Afro-Asian Congress of Ophthalmology
Guangzhou, China
Contact: Zhongshan Eye Center, SUMS, New Building, Room 919, 54 Xianlie Nan Road, Guangzhou 510060, PR China
Tel: (86 20) 8760 2402
Fax: (86 20) 8777 3370

11-18

Laser Techniques in Ophthalmology — Caribbean Cruise
Fort Lauderdale, FL, USA
Contact: Sea Courses Cruises and Tours, #505-402 West Pender Street, Vancouver, BC, Canada V6B 1T6
Tel: (604) 684 7327 or (1 888) 647 7327
Fax: (604) 684 7337 or (1 888) 547 7337

17-19

1st International Ophthalmic Nursing Conference
Jerusalem, Israel
Contact: Royal College of Nursing, United Kingdom
Tel: (44 171) 647 3578
Fax: (44 171) 647 3412

27-28

Glaucoma: An Asian Theme & Inaugural Meeting of the Southeast Asian Glaucoma Interest Group
Contact: Dr Prin Rojanapongpun, Department of Ophthalmology, Chulalongkorn University & Hospital, 1873 Rama 4 Road, Bangkok, Thailand
Tel: (66 2) 256 4423
Fax: (66 2) 252 8290

DECEMBER

1-4

Singapore National Eye Centre (SNEC) 10th Anniversary International Congress
Singapore
Contact: Ms Hua Meng Lee, The Organising Secretariat, Singapore National Eye Centre, 11 Third Hospital Avenue, Singapore 168 751
Tel: (65) 322 8374
Fax: (65) 227 7290
E-mail: snecpr@pacific.net.sg

JANUARY 2001

26-28

5th European Society of Cataract and Refractive Surgeons (ESCRS) Winter Refractive Surgery Meeting
The Algarve, Portugal
Contact: European Society of Cataract and Refractive Surgeons
Tel: (353 1) 661 8904
Fax: (353 1) 678 5047
E-mail: escrs@agenda-comm.ie

FEBRUARY 2001

1-2

1st International Congress on Non-Penetrating Glaucoma Surgery
Lausanne, Switzerland
Contact: Tarek Shaarawy
Tel: (41 21) 626 8111/8878
E-mail: glaucom@optal.vd.ch

16-18

Annual Conference of Vitreo Retinal Society
Jaipur, India
Contact: Dr Gopal Lal Verma
Tel: (91 141) 521 462
E-mail: shimo@satyam.net.in

23-25

23rd All Pakistan Ophthalmological Congress
Peshawar, Pakistan
Contact: Dr Nasir Saeed, Secretary Organising Committee, Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences, Hayatabad Medical Complex, Peshawar, Pakistan
Tel: (92 91) 825 087
Fax: (92 91) 814 438
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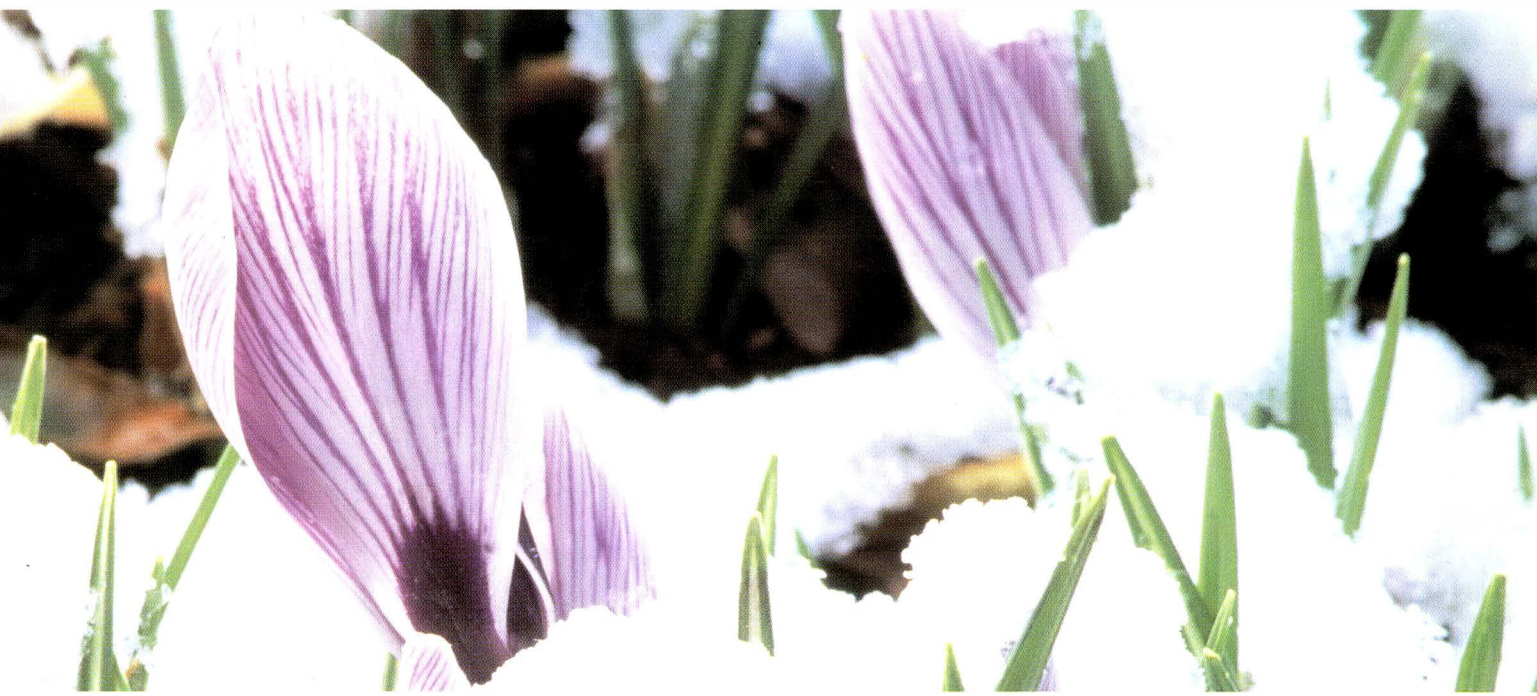

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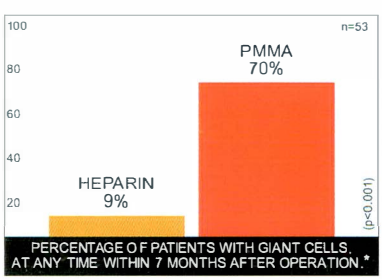

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* Philipson B., Fagerholm P., Calel B., Grunge-Löwenrud A. The three-year results of a randomized double-blind study on heparin surface modified IOL versus an unmodified IOL. Paper presented at the *11th Congress of the European Society of Cataract and Refractive Surgeons (ESCRS) September 1993, Innsbruck, Austria.*

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