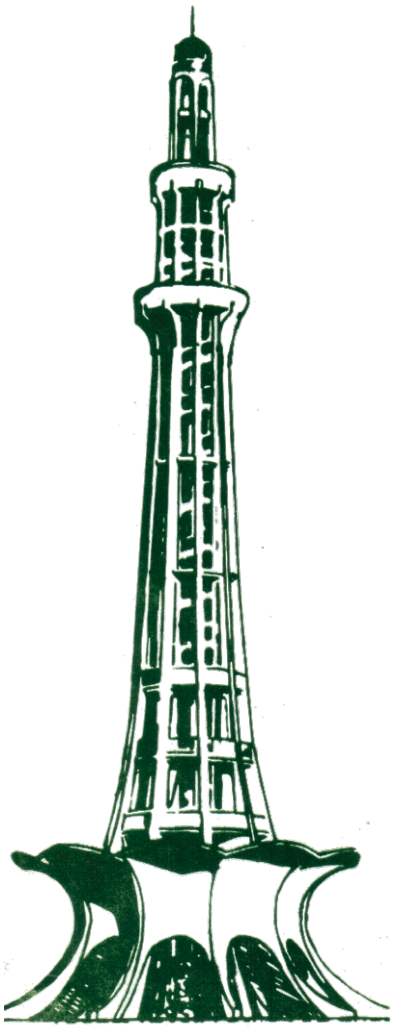
مجلہ طب العیون پاکستان

PAKISTAN JOURNAL OF OPHTHALMOLOGY

THE OFFICIAL JOURNAL OF THE OPHTHALMOLOGICAL SOCIETY OF PAKISTAN

VOL. 2 NO. 2 APRIL 1986 PUBLISHED QUARTERLY



ISSN 0886-3067

In The Name of Allah, The Beneficent, The Merciful

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Volume 2 Number 2 April, 1986 شعبان ۱۴۰۶

ISSN 0886-3067

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Page

Publisher: Khalid J. Awan, M.D., F.P.A.M.S.

Manuscripts: Send manuscripts and all correspondence related to them to Khalid J. Awan, M.D., F.P.A.M.S., Editor, Pakistan Journal of Ophthalmology, 1921 Park Avenue, S.W., Norton, Virginia 24273 U.S.A.

Subscription: Non-members. Pakistan, R. 400.00 per year; United States, $50.00 per year; Elsewhere U.S. $60.00 per year by surface mail and $98.00 by air mail. Single copies: Pakistan Rs. 150, Elsewhere U.S. $15. Send subscription with check or money order to Pakistan Journal of Ophthalmology, 1921 Park Avenue, S.W. Norton, Virginia 24273 U.S.A.

Address changes: POSTMASTER please send address change to Pakistan Journal of Ophthalmology, 1921 Park Avenue, S.W., Norton, Virginia 24273 U.S.A.

Published quarterly in January, April, July and October.

Publication and Editorial Staff:

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Odds and Ends: Sohaib Awan, Musa Awan, and Maryam Awan.
Printed by: Norton Press, Inc., Norton, Va.

PAKISTAN JOURNAL OF OPHTHALMOLOGY

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OPHTHALMOLOGICAL SOCIETY OF PAKISTAN

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Urdu Abstract

اردو خلاصہ جات

از خالد اعوان

لیپرسی ہسپتال بالاکوٹ، ہزارہ، پاکستان میں جذام کے مریضوں میں آنکھوں کے مسائل۔ حنفین شاد محمد اور خادم اللہ کاخیل نے ۸۵ جذام کے مریضوں میں ۴۸ میں مکمل برص جذام، ۲۲ میں معمولی درجہ جذام، ۶ میں مکمل درجہ جذام، ۶ میں معمولی برص جذام، اور تین میں معمولی جذام پایا۔ مرد اور عورت کی نسبت ۲:۱ تھی۔ وسطی عمر ۵۲ اور وسطی عرصہ مرض ۱۰۶ سال تھیں۔ ساٹھ فی صد مریضوں میں آنکھیں بھی متاثر تھیں ان میں ۳۴ میں ابروؤں کا جھڑنا، ۴ میں پلکوں کا جھڑنا، تین میں پلکوں کا انحراف ۲۲ میں قرنیہ کے مسائل (داغ، ناسور یا/اور بے حسی) ۱۷ میں التہاب الشبکیہ والجسم الہدبی، تین میں پیپو لوں کی کمزوری، ایک میں پیپو لوں کی خارجی کجی، تین میں ظفرہ، اور ایک میں کہنہ التہاب القرنیہ الکیس الدمعی پائے گئے۔ دس مریض امامی التہاب العنبیہ، تین قرنیہ کے مسائل اور ۴ سفید موتیا کی وجہ سے نظر کھو بیٹھے۔ (پاکستان جرنل آف اپتھلمالوجی ۲:۴، ۱۹۸۶)

شبکی رگوں کی پیچیدگی مصنف احمد محمد منصور۔ شبکی رگوں کی پیچیدگی عینی، انسانی، اور جسمانی کیفیتوں میں عام مشاہدہ میں آتی ہے مگر طبی ادب میں معمولی اور غیر معمولی شبکی رگوں کی پیچیدگی میں شناخت پر بہت کم مواد ملتا ہے۔ مصنف نے ان بیماریوں جن میں شبکی رگوں کی پیچیدگی پائی جاتی ہے کی فہرست پیش کی ہے۔ اُس جیسا رکاوٹ سے اس پیچیدگی کی مناسب درجہ بندی کی جاسکنے کی اشد ضرورت ہے (۲:۸، ۱۹۸۶)

قطری شق القرنیہ پر قلیل عرصہ مطالعہ کے نتائج۔ PERK STUDY گروپ۔ اس یک سالہ مطالعہ کا مقصد قطری شق القرنیہ کی غیر ضرر رسانی، تقشیر پذیری، اور تاثیر کا جانچنا تھا۔ اس مطالعہ میں ایک مخصوص عمل جراحی اور معینہ طبی معالجہ استعمال میں لائے گئے۔ (مجلہ طب العیون پاکستان ۲:۵، ۱۹۸۶)

آنکھ کے ناقبہ زخموں کا انذار اور علاج۔ مصنفین خالد جاوید اعوان اور محمد ہمایوں: آنکھ کے ۶۴ ناقبہ زخموں میں سے ۱۰ میں فقط قرنیہ، ۱۴ میں قرنیہ اور صلبیہ، چھ قرنیہ یا صلبیہ اور عدسہ، نو قرنیہ صلبیہ، عدسہ اور/یا زجاجیہ، اور سات میں دو یا زیادہ ناقبہ زخم تھے۔ ۲۶ آنکھوں میں مختلف اقسام کے خارجی ٹکڑہ جات بھی تھے تین آنکھیں جراثیمی التہاب باطن العین کی وجہ سے نکالنی پڑیں۔ مصنفین نے مندرجہ ذیل تجاویز ناقبہ زخموں کے علاج کے لئے پیش کی ہیں۔ ۱۔ بڑے زخم آہستہ آہستہ معائنہ کے ساتھ تھوڑے تھوڑے کر کے بند کرنے چاہئیں۔ ۲۔ جب ایک سے زیادہ حصوں کو چوٹ آئی ہو تو عمل جراحی متعدد مرحلہ جات میں مکمل کرنا چاہئے۔ ۳۔ تمام بصد از مرکز قرنیہ کے زخموں کو ٹانکے لگانے چاہئیں۔ ۴۔ استیصال الزجاجیہ آنکھ کے شدید ناقبہ زخموں کے علاج کا مجرب اور بہتر طرز علاج ہے بشرطیکہ اس کے استعمال کا وقت خوب سوچ بچار کے بعد متعین کرنا چاہئے۔ ۵۔ جراثیمی التہاب باطن العین ناقبہ زخموں کا سب سے زیادہ خطرناک مسئلہ ہے۔ (مجلہ طب العیون پاکستان ۲:۶۰، ۱۹۸۶)

Scholarship Schedules

IX Congress of the Ophthalmological Society of Pakistan

April 25, 26, and 27, 1986, Quetta, Pakistan

The 9th Congress of the Ophthalmological Society of Pakistan will be held on April 25-27, 1986 in Quetta. The Baluchistan Branch of the Society is the host for this conference. The kind manners and warm hospitality of the people of Quetta and Baluchistan will certainly make this a memorable professional as well as social experience. A large gathering of professionals and speakers expert in their respective fields is attending.

For registration material and submission of abstracts contact: Dr. Muhammad Naseem, General Secretary, Helpers Eye Hospital, Sairab Road, Quetta, Pakistan. Telephone: 77915 and 78560.

XXV International Congress of Ophthalmology

May 4-10, 1986, ROME, ITALY

The 25th international Congress of Ophthalmology, one of the most prestigious events in international ophthalmology will be held in Rome, Italy on May 4-10, 1986. The dates make it very convenient to attend it right after the 9th Congress of Ophthalmological Society of Pakistan. The Congress allows one to combine the sights of ancient Rome with learning about modern ophthalmic developments.

For registration and accommodations contact: Rome, 86 - Coordinating Center, c/o EGA Congressi, Viale Tiziano 19, 00196 ROME, ITALY. Telephone:06/3960341, Telex: 614357EGA PL1. For submission of abstracts: Franco D'Ermo, M.D., Chairman, Scientific Program, Via Tagliamento, 9, 00198 ROME-ITALY Tel:06/864927.

Editorials

New Developments in Ophthalmic Surgical Techniques and Technology

Recent years have brought many exciting and new advances in ophthalmic surgical methods. A few new techniques have attained the popularity of routine procedures in a remarkably short period and have revolutionized the practice of ophthalmology. Some of the procedures that were current and standard a few years ago have become occasional or obsolete in the United States. The remarkable improvements in the technological aspects of ophthalmic surgery have made it possible to cure conditions which a few years ago were considered inoperable. It is not practical here to give details, or even to make mention, of all of the new advances, but for the benefit of Pakistani ophthalmologists, a few of these are included in this commentary. This editorial is intended not only to inform our readers but also to stimulate them to find ways to bring ophthalmic care in Pakistan to the level of the current international standards.

In cataract surgery, extracapsular irrigation-aspiration technique has become most popular. This is mainly due to improvements in the equipment and increasing popularity of posterior chamber intraocular lens implants. Today, almost 90 percent of cataract extractions in the United States are accompanied by an IOL insertion.[1] The posterior chamber implant is the most popular, the anterior chamber lens a distant runner-up, and iris-fixation implant the least favorite. The short-and medium-term results of posterior chamber and anterior chamber implants are very encouraging. The anterior chamber lens is most popular for secondary implantation and intracapsular surgery. The popularity of posterior chamber IOL comes from the reduced postoperative complications.[2,3] The major postoperative problem with extracapsular surgery with posterior chamber implant is the opacification of the posterior lens capsule. However, the availability of the YAG laser has greatly simplified the management of this problem Pakistani surgeons interested in extracapsular surgery must carefully consider the poor followup return visits by the patients and the non-availability of expensive equipment like the YAG laser units in Pakistan. It is noteworthy that the introduction of the posterior chamber lens has also led to a reduced incidence of postoperative retinal detachment. Recently, IOLs which can absorb certain light wavelengths that are injurious to the retina have been introduced. However, the actual value of these lenses remains to be proven.

Laser trabeculoplasty has attained wide popularity for the initial non-medical management of open-angle glaucoma. However, the long-term results of laser trabeculoplasty remain to be seen. It has been noticed that the laser trabeculoplasty begins to lose its effectiveness with time,[1] and its usefulness in patients under the age of 40 has been questioned.[4] The application of lasers to create an iridotomy in angle-closure is another exciting development. One must be alert for sudden and severe rise of intraocular pressure a few hours following these procedures. This rise has caused further deterioration of the visual fields in some patents.[5] These applications of lasers and their results must be carefully studied (and published) for the Pakistani population to acquire a scientific knowledge of their optimum usefulness and safety in Pakistani patients.

The YAG laser is also being used for cutting membranes in the vitreous that are 3 mm or more away from the retina. The use of coagulation lasers, such as argon blue and green, for trabeculoplasty and retinal vascular disorders has become routine. A definite usefulness of photocoagulation in the treatment of exudative senile macular degeneration without associated retinal pigment epithelial detachment has been demonstrated.[6] Another exciting development is the use of excimer laser for creating extremely fine and controlled corneal incisions in radial keratotomy, keratoplasty, and other similar procedures.[7] Endophotocoagulation employs lasers to treat retinal vascular diseases and retinal tears during surgery in the vitreous cavity. Krypton lasers (red and yellow) are proving useful in the treatment of subretinal neovascular membranes, particularly in the avascular macular zone, even through a moderately cataractous lens and vitreous that is slightly hazy due to hemorrhage in it. A tunable dye laser has been developed with which one can literally dial in the desired wave length. In the future, the bulky laser units may be reduced to very convenient sizes without losing any energy. Hence, a diode laser of the size of the eraser at the end of a lead pencil will be able to generate the energy of one of the large clinical laser units in use today.[1] Extraocular applications of laser in ophthalmology have recently been introduced.[8,9,10]

Improvements in instrumentation and modifications in technique have perfected vitrectomy to such a degree that it is being routinely employed for diagnostic and therapeutic purposes. Silicone oil has become more and more popular in vitreoretinal surgery. However, Pakistani ophthalmologists must not forget the complications of

cataract formation, glaucoma, and keratopathy that resulted in the past from the use of silicone oil. The use of long-acting gases and the air pump to infuse air into the vitreous cavity for maintaining intraocular pressure during intravitreal manipulation has significantly enhanced surgeons' ability to perform vitreoretinal procedures. A new technique uses "retinal tacks" to successfully repair retinal detachments that were previously inoperable.[11]

Keratorefractive surgery has perhaps benefited the most from modern technical advances. Radial keratotomy for the treatment of myopia is fast becoming the most frequently performed procedure in the United States.[1] Epikeratophakia of Kaufmann is a technique in which a prelathed button of donor cornea is sutured on the surface of the recipient cornea. In keratomileusis of Barraquer a button of the patient's own cornea is frozen, reshaped by lathing to a required curvature, and resutured in its original site. In keratophakia, a frozen and prelathed donor button is inserted into the stroma of the recipient's cornea. Several techniques for incisions in the cornea are being employed for the correction of astigmatism. It is very important to realize that all of these surgical procedures require great skill, experience, and sophisticated equipment. — Khalid J. Awan

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Radial Keratotomy

Radial keratotomy for the treatment of myopia has rapidly become very popular among ophthalmologists in the United States. A summary of the short-term results of prospective evaluation of radial keratotomy (PERK) study appears on page 50 of this issue. Although technically the procedure is not very complicated the preoperative evaluation and measurements are most crucial and require expensive sophisticated equipment. The well-defined professional, ethical, and legal restrictions in the United States on surgeons who wish to perform new procedures provide adequate safety for the patients. In Pakistan, these vitally important safeguards for the welfare of the patients are usually not fully enforced. This may encourage, or even tempt, an inadequately skilled ophthalmologist to perform radial keratotomy in a poorly equipped facility in Pakistan. It is strongly advised that the medical academic institutions, the Ophthalmological Society of Pakistan, and other local and national professional organizations make a unified effort for a carefully planned study in which a number of selected surgeons who fully qualify for doing radial keratotomy perform it according to clearly specified guidelines in well-equipped places. The conclusions of this study should form the basis for the mass application of radial keratotomy in Pakistan.

The principle behind radial keratotomy for the treatment of myopia is simple, but the success of the procedure depends almost entirely on the accuracy of its execution. Very serious postoperative complications including epithelial downgrowth, cataract formation, and endophthalmitis have been reported following radial keratotomy. It is most important that the patients must be made fully aware of the complications and limitations of the procedure before they submit to it.[1-4] A recent report from the United States warns about the medicolegal problems of radial keratotomy.[5] Many ophthalmologists have been accused of malpractice for serious postoperative glare, inability to wear contact lenses, corneal incisional fungal abscess, thick corneal scarring, cataract formation, etc. following radial keratotomy. In one instance, radial keratotomy disqualified a man for the position of a pilot in the military. In one patient the ophthalmologist did not use an optical zone marker. Of greatest importance is a full, detailed, maybe even recorded, preoperative discussion with the patient. Dr. Kaufman,[6] one of the leading corneal surgeons in the United States comments: "I would be reluctant to perform this surgery on someone in my own family." This should be enough to give second thoughts to any conscientious Pakistani ophthalmic surgeon who is not adequately trained and has not a fully equipped unit to perform radial keratotomy.

— Khalid J. Awan

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Remarks and Replies

Management of Injuries to the Lacrimal Drainage System

The traumatic scarring of the lacrimal drainage passages may lead to an annoying and incapacitating epiphora. This consequence of ocular injuries places a responsibility on the shoulders of all who provide ophthalmic care to be well prepared in skill and knowledge for handling such cases. Of utmost importance is full understanding of the anatomy of the nasolacrimal passages, without which any useful operative handling will not be possible. I have seen that the injuries involving the canaliculi or the lacrimal sac are poorly handled in Pakistan. Fortunately, a patent upper canaliculus in the presence of a scarred down lower traumatized canaliculus may sometimes prove efficient in preventing epiphora under ordinary circumstances.

The advent of microsurgery has made it possible to accurately anastomose the ends of a lacerated canaliculus. I use 10-0 nylon sutures to join the cut ends. I am very pleased with my results. Of course, insertion of polyethylene tubing is an integral part of my surgical procedure. I leave the tubing in place at least for three months.

In handling the lacerations of the lacrimal sac, I prefer to carry out an immediate dacryocystorhinostomy. I have had fairly satisfactory results from this approach. Where there is extensive trauma to the lacrimal drainage system, surgery should be restricted to the repair of the lid lacerations. I do not think there is any place for introduction of any tubing, at least in the initial stage of repair.

A. Razzak Lakhani, D.O. (London)
Karachi, Pakistan

Microsurgery and Lacrimal Trauma in Pakistan

I agree with Dr. Lakhani in that the repair of canalicular trauma can be executed with much greater precision under a microscope than with an ordinary loupe. In Pakistan, microsurgical techniques are currently being employed by only a few progressive ophthalmologists. Unavailability of equipment and necessary training are the probable cause of this. Only major academic centers have sufficient microsurgical equipment. It is, however, very encouraging to see that some interested privately practicing ophthalmologists in larger cities of Pakistan have most modernly equipped clinics. Some of them have done it to bring the prevailing international standard of ophthalmic care to Pakistan; other for fear of losing to competition. Whatever the reason, the trend is most welcome.

I am pleased to say that a very nicely arranged program was held in Karachi in February, 1986. It is important that other ophthalmic centers in the country make similar programs available to ophthalmologists in their areas. This will improve the management of ocular trauma, and the rest of the ophthalmic care in Pakistan.

The use of polyethylene or silicone tubing and Worst's pigtail probe is regarded as too risky and traumatic for the intact lacrimal passages, and, hence, their use is discouraged by some authors.[1] However, these methods are not without value in carefully planned procedures.[1,2] Currently, Veir's stainless steel rod is favored in the repair of torn canaliculus.[3] The torn ends are sleeved on the rod and sutured together with 10-0 nylon under a microscope. Hence, the intact canaliculus and the lacrimal sac are not manipulated and any trauma to them is avoided.

Finally, I want to point out that Lakhani's opinion that in cases of severe trauma to lacrimal passages one should not attempt to repair them and only limit the surgery to lid suturing is not shared by others. Quickert[1] on the basis of his experience advises that in every instance "early repair is warranted."

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Stimulus, Response

I am most pleased by the regular publication of the Pakistan Journal of Ophthalmology, without a doubt a journal of high standard in all respects. Now, I am even more interested in writing articles. Unfortunately, the lack of proper facilities, particularly in the peripheral area like ours, to do it, makes it very difficult. However, we are making all efforts to produce scientific articles with whatever facilities are available. We shall be, Insha Allah, regularly writing papers in the future. At present I am interested in the topics of IOL surgery, trabeculectomy, trauma management, orbital reconstruction and implants, and therapy of corneal ulcers. We are carefully accumulating data on our experience in these subjects. Our greatest problem in writing is the difficulty of getting relevant reference material. We would greatly appreciate any help in this matter from you and your readers.

Saeed Ahmed Khan, F.C.P.S.
Hyderabad, Pakistan

– Please write me specifying on what aspects of a subject you need references. I will try to get these for you. An article on how to obtain reference material is also scheduled to appear in one of the future issues of The Journal. The Pakistan Academy of Medical Sciences, 1921 Park Avenue, SW, Norton, Virginia 24273 U.S.A. is another reliable source for such help.

– Khalid J. Awan, M.D.

Book Review

GENETICS OF OCULAR DISEASE, ACUTE RETINAL NECROSIS SYNDROME, PHTHISIS BULBI. Vol. 10 of Developments in Ophthalmology. W. Straub, Editor. New York, S. Karger. 1985.

This volume contains three monographs: 1. Multifactorial or polygenic inheritance in ophthalmology by the late J. Francois, discussing closed-angle glaucoma, open-angle glaucoma, congenital glaucoma, ocular refractive errors, strabismus, microphthalmos, lattice degeneration of the retina, and structure and color of the iris. The chapter is followed by a small paragraph on conclusions. The chapter also includes a long list of up-to-date references. 2. So-called 'acute retinal necrosis syndrome' an acute ocular panvasculitis syndrome by S.S. Hayreh. The author adds four new cases to 74 previously reported cases. He discusses clinical features, laboratory studies, systemic findings, stages of the disease, differential diagnosis, treatment, pathogenesis, and terminology. In his conclusion, he also proposes that the currently popular name of "acute retinal necrosis syndrome" be changed to "acute ocular panvasculitis syndrome." 3. Phthisis bulbi-an intraocular fluoride proliferative reaction by F.H. Stefani. This paper includes discussion of clinical findings, gross and microscopic pathology, and the relationship of phthisis bulbi to wound healing and cellular reaction. The paper includes 43 photographic excellent figures, a summary, and a long list of current references.

— Reviewed by Khalid J. Awan

MICROSURGERY UPDATE. 1982-1984. Editor: F. Bigar. Volume 11 of Developments in Ophthalmology. Editor: W.Straub. New York, S. Karger, 1985.

This volume contains papers presented at the 10th biennial meeting of the International Ophthalmic Microsurgery Study Group (IOMSG). It includes sections on technical problems in ophthalmic microsurgery, corneal donor material and corneal preservation, corneal surgery, glaucoma surgery, cataract surgery, and vitreoretinal surgery. Cryopreservation still is considered to be damaging to the endothelium, and its influence on the alteration of genetic nuclear material in the frozen endothelium is in need of further investigation. A report from Denmark concludes that McCarey-Kaufman (MK) medium is a very practical and convenient method of cornea preservation; however, the possibility of infection still is entertained. No appreciable difference in results were found between MK stored corneas and cultured corneas. Keratokyphosis eliminates the need to freeze corneas for keratophakia. An intriguing technique to aspirate ectopia lentis is presented with clear photographs. Various glaucoma techniques are evaluated. In one report it is proposed that because Hruby clearly described cystoid maculopathy associated with vitreous adhesions to the corneal wound after cataract surgery at least two years before Irvine, the entity of Irvine-Gass syndrome should be called "Hruby-Irvine-Gass Syndrome." This volume is useful reading.

—Reviewed by Khalid J. Awan

COMPUTERIZED TOMOGRAPHY IN ORBITAL DISEASE AND NEURO-OPHTHALMOLOGY. By Robert G. Peyster and Eric D. Hoover. Chicago, Year Book Medical Publishers, Inc. 1984 300 pages including index, illustrated with black and white figures, hardcover. U.S. $85.00.

Recently, during an international medical conference in Pakistan, a neurosurgeon mentioned to me that he wished the medical literature and meetings in Pakistan provided more information on neuro-ophthalmology. The significance of neuro-ophthalmology is self-evident, and any literature that makes its comprehension easier is most welcome. The book by Peyster and Hoover certainly is one of such welcome additions that will equally benefit and enlighten ophthalmologists, neurosurgeons, neurologists, and ragiologists.

The high resolution multi-plane computerized axial tomography has revolutionized the radiologic aspects of neuro-ophthalmic and orbital diagnosis. It has also become an integral part of the literature published on these topics, and the reader not familiar with CT imaging may not fully benefit from the current literature. The book has a text-atlas format in which each chapter consists of a large number of fully captioned figures of CT images, preceded by a concise text with a good list of up-to-date references.

The book is divided into four parts, orbits, sella, posterior visual pathways, and ocular motility disorders, that follow an excellent chapter on "High Resolution CT Scanning." Each part is further subdivided into chapters. Each chapter consists of presentation of various common and some unusual disorders related to the heading of the chapter, illustrating each entity with crisp and easily understandable CT images from different views. The section on sella is perhaps the most impressive, but other sections are in no way less valuable. In chapter 7, it would have been nice if figures to show intracranial changes associated with retinal vascular disorders, such as cavernous hemangioma, were included in addition to CT images of Coats's disease. This and a few other exclusions in other chapters are insignificant in view of the overall excellence of the book.

The text is easy on the eyes and all the figures extremely well reproduced. I have no doubt that all ophthalmologists, practicing and in training, will find this text most valuable. I highly recommend this book.

— Reviewed by Khalid J. Awan

Original Article

Ocular Complications in Leprosy Patients from Leprosy Hospital, Balakot, Hazara, Pakistan

Shad Mohammad, F.R.C.S.
and
Khadimullah Kakakhel, D.D.V., F.A.M.S.

ABSTRACT: The authors studied 85 patients from the Leprosy Hospital, Balakot, Hazara, Pakistan. Out of these, 48 had lepromatous leprosy, 22 border line tuberculoid leprosy, six tuberculoid leprosy, six border line lepromatous leprosy, and three border line leprosy. The male to female ratio was 2:1. The mean age was 52-year and mean duration of the disease was 17.6 years. The ocular complications were found in 60% of the patients. These complications included loss of eyebrows in 34 patients, loss of eyelashes in four, trichiasis in three, corneal changes (including opacity, ulceration, and/or anesthesia) in 22, iridocyclitis in 17, lagophthalmos in three, ectropion in one, pterygia in three, and chronic dacryocystitis in one. Of the total of 17 (20%) who went blind from ocular complications, 10 did so due to anterior uveitis, three due to corneal complications, and four due to cataract formation. (Pak J Ophthalmol 2:43-45, 1986).

Leprosy or Hansen's disease is caused by *Mycobacterium leprae,* an organism first identified by Hansen in 1874. According to a recent WHO survey there are 10 to 15 million leprosy patients in the world.[1]

In the eye it is the anterior segment which bears the brunt of the disease. Blindness occurs mainly due to iris and corneal involvement.

This study was carried out to document the ocular complications of leprosy. The Leprosy Hospital, Balakot has 990 registered patients. The hospital is jointly run by Health Department of Northwest Frontier Province of Pakistan and German Mission of Aid to the Leprosy Patients.

MATERIAL AND METHODS

At random 85 patients were selected from the register of Leprosy Hospital Balakot. They were examined between October, 1984 and April, 1985. In each case name, age, sex and duration of the disease were noted. The patients were classified in five groups tuberculoid leprosy (TT), boarder line tuberculoid leprosy (BT), boarder line leprosy (BB), boarder line lepromatous leprosy (BL) and lepromatous leprosy (LL) according to Ridley and Jopling[2] and modified by Leiker.[3] The ocular examination included testing of

Figure 1. (Mohammad & Kakakhel): Loss of eye brows in a patient suffering from lepromatous leprosy.

Accepted for publications December 22, 1985.

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visual acuity, macroscopic examination of eye brows, lids, conjunctiva and sclera. The cornea, anterior chamber and iris were examined by portable Zeiss slit lamp. The function of facial nerve was tested and fundoscopy was done with direct ophthalmoscope. The corneal sensation was tested with a whisp of cotton wool and intraocular pressure was measured with Schiotz tonometer. For the purpose of this study blindness was recorded if the visual acuity was less than 1/60 in both eyes.

RESULTS

Out of the total 85 patients 59 (69%) were male and 26 (31%) were female. The sex distribution of different types of leprosy patients is shown in table 1.

TABLE 1
DISTRIBUTION OF 85 PATIENTS ACCORDING TO SEX AND TYPE OF LEPROSY*

Sex	LL	B L	BB	BT	TT
Male	33	3	3	16	4
	(38.8%)	(3.5%)	(3.5%)	(18.8%)	(4.7%)
Female	15	3	—	6	2
	(17.6%)	(3.5%)		(7%)	(2.3%)
Total	48	6	3	22	6
	(56.4%)	(7%)	(3.5%)	(25.8%)	(7%)

* LL: lepromatous leprosy; BL: border line lepromatous leprosy; BB: border line leprosy; BT: border line tuberculoid leprosy; TT: tuberculoid leprosy.

The age of the patients varied between 21 and 85 years, with a mean age of 52 years. The duration of disease was from 1 year to 46 years with a mean of 17.6 years. Among these 51 patients (60%) had ocular complications. The various complications observed are presented in table 2. Blindness occured in 17 (20%) of the total patients. Ten out of 17 were blind due to iritis, 3 due to corneal complications and 4 due to cataract.

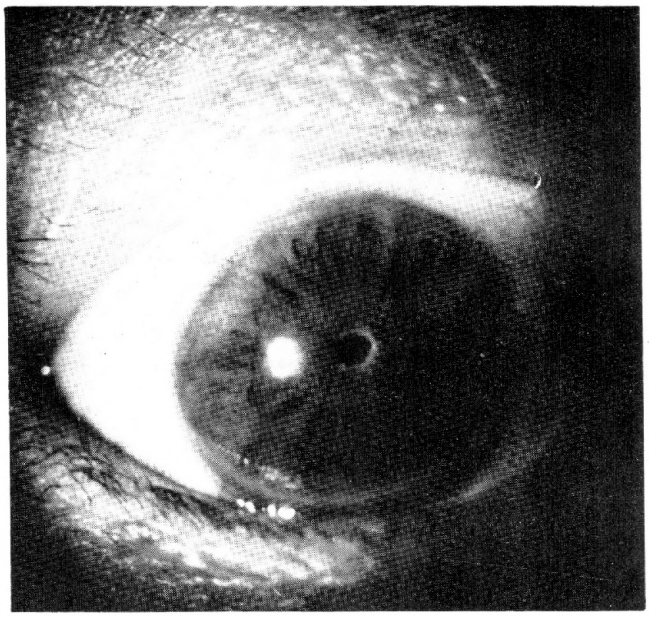

Figure 2. (Mohammad & Kakakhel): Miotic nonreacting pupil due to chronic Iritis in a patient of lepromatous leprosy.

DISCUSSION

The incidence of ocular complications in leprosy varies from series to series.[4,5,6] Shields et al[4] reported the ocular complications in 72% of cases, Dethlefs[5] in 52% of cases and Malla et al[6] in 74.2% of cases. In our study the incidence of ocular complications in leprosy was 60 percent.

The loss of eyebrows was the commonest complication in lepromatous leprosy. It was observed in 55% of the total cases of LL and BL type and only in 14% of BT and TT type patients. Loss of eyebrows is a cosmetic blemish, but may be a useful clue to other ocular complications in lepromatous leprosy (Figure 1).

TABLE 2
INCIDENCE OF OCULAR COMPLICATIONS ACCORDING TO THE TYPE OF LEPROSY*

	LL		BL		BB		BT		TT	
Total No. of patients	48		6		3		22		6	
Loss of eyebrows	27	(56.2%)	3	(60%)	—	—	3	(13.6%)	1	(16.6%)
Loss of eyelashes	4	(8.3%)	—	—	—	—	—	—	—	—
Trichiasis	3	(6.2%)	—	—	—	—	—	—	—	—
Pterygium	3	(6.2%)	—	—	—	—	—	—	—	—
Lagophthalmos	—	—	—	—	3	(100%)	—	—	—	—
Corneal opacities	7	(14.5%)	—	—	—	—	1	(4.5%)	—	—
Corneal ulcers	4	(8.3%)	—	—	—	—	—	—	—	—
Corneal anesthesia	5	(10.4%)	—	—	—	—	5	(22.7%)	—	—
Chronic iritis	12	(25%)	—	—	—	—	1	(4.5%)	—	—
Acute iritis	3	(6.2%)	—	—	—	—	1	(4.5%)	—	—
Ectropion	—	—	—	—	—	—	1	(4.5%)	—	—
Chronic dacryocystitis	—	—	—	—	—	—	1	(4.5%)	—	—

*LL: lepromatous leprosy; BL: border line lepromatous leprosy; BB: border line leprosy; BT: border line tuberculoid leprosy; TT: tuberculoid leprosy.

Iritis as reported in other series[4,5,6,7,8,9] occured most commonly in patients with lepromatous type of leprosy. The incidence of iritis was about 27% of LL and LP patients, while it was observed in 7% of BT and TT type patients, majority of these patients were suffering from chronic iritis (76%), while only 23.6% were suffering from acute iritis. In chronic iritis there was deposition of white flocculent material around the pupillary margin. Miosed pupil (Figure 2) associated with even early lens opacities has profound effect on the visual acuity. Ffytche[10] has suggested that chronic iritis in leprosy is more of a neuroparalytic origin than due to true inflammation.

Corneal lesions included corneal opacities which were observed in 9.4% of the total patients (LL:13%, TT:3.5%) and corneal ulcers which were seen in 4.7% of the patients, they were all of LL Type. Corneal sensations were reduced or lost in 11.7% of cases (LL:9.2%) TT:17.8%) as compared to 7% reported by Malla et al[6] and 3% observed by Ticho and Ben Sira.[8]

Lagophthalmos was observed in 3.5% of patients. They were all of BB type. In Dethlefs's study lagophthalmos occurred in 5.4% of cases and like our study they were also of BB type.[5]

Surprisingly we did not see any patient with raised intraocular pressure though this has been reported previously.[6]

Blindness occured in 20% of the cases as compared with 12% observed by Dethlefs[5] and 12.7% reported by Malla et al.[6] Majority of these patients were blind due to complications of iritis (58.8%). The rest 17.6% were blind due to corneal lesions and 23.5% due to cataract.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the cooperation of Dr. Feroz Din, Miss Adelheid Nestle and staff of Leprosy Hospital, Balakot. We would also like to thank Dr. Jahangir A. Khan of PMRC for his critical review of this paper, manuscript was typed by Mr. Sadat Khan.

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Ophthalmic "Past Pourri"

To Treat Like A Leper — "To The Fullest"

"In general, however, hospitals for the reception of lepers were supported by chance eleemosynary contributions...But even under the most favorable circumstances the leper was...considered both legally and politically as a dead person. Upon being set apart from his fellow creatures the ceremonial for the burial of the dead was pronounced over him, masses were said for the benefit of his soul, and, to carry out the illusion to the fullest extent, a shovelful of earth was thrown upon his body."

George Ripley and
Charles A. Dana (eds.) - 1875
From an Account of
Leprosy in 13th and 14th Century Europe
The American Cyclopaedia: A
Popular Dictionary of
General Knowledge, p. 362

Camera Clinicals

Edited by: Khalid J. Awan, M.D., F.P.A.M.S.

In this section of the Journal, photographic documentations of interesting and challenging observations will be presented to the readers. They should make their diagnoses from the given information and compare these with the ***expositions*** *on page 57-59. — Editor*

Figure 1: A 27-year-old pathology laboratory assistant felt a sudden and sharp pain in his right eye while washing pathology specimen bottles. Gradually the sharp pain changed to a burning sensation and the conjunctiva became swollen and red. The vision was slightly blurry. On examination, his vision was 20/30 (6/9) in the right eye and 20/20 (6/6) in the left. External examination showed the redness and chemosis of the conjunctiva with maximum swelling near the nasal limbus. The cornea adjacent to the nasal conjunctiva showed a crescentic irregularity (Figure 1), which stained intensely with fluorescein. Tears continuously poured from the eye. Topical antibiotics cleared the condition in three days without any sequela.

Figure 2. A 63-year-old man had undergone triple bypass heart surgery and felt extremely weak even two months after the surgery. He complained of irritation in his left eye with excessive tearing, but what bothered him most was blurriness of sight in that eye. There was no frank pain, but the patient admitted to having a sensation of "something rubbing against the eye" when he blinked. Examination showed that the visual acuity was 20/25 (6/9) in the right eye and 20/60 (6/18) in the left. The left eye had marked redness with tearing. Slit lamp findings in the cornea were confirmed by rose bengal staining (Figure 2).

Figure 3. A 30-year-old man came for a routine eye examination. He had no specific complaint. His vision was 20/20 (6/6) in each eye. All of the eye examination was unremarkable except for an unusual ringlike brownish discoloration of the limbus (Figure 3). The corneas were otherwise clear and normal in structure by biomicroscopy. The finding was bilateral and perfectly symmetrical in both eyes. The systemic investigations were within normal limits.

Figure 4. A 32-year-old man requested eye examination for any change in his glasses prescription. On eye examination his vision was 20/20 (6/6) in each eye with glasses. External eye examination was normal. On ophthalmoscopic examination no abnormal retinal changes were present. The cornea of each eye had a circular grayish discoloration of the periphery (Figure 4). The patient had never noticed any unusual change in his eyes. Other than mild hypertension the patient's general health was good.

Figure 5. A 23-year-old woman came in with a sudden loss of sight in her right eye. She had seen just as well from both eyes before this happened. She had no respiratory, gastrointestinal, or circulatory health problems. She was pregnant with her first baby and was in the second trimester. Her obstetrician had not noticed any remarkable change in her health. On eye examination, she was barely able to count fingers in the peripheral field of the right eye, but the visual acuity was 20/20 (6/6) in the left eye without any corrective lenses. Biomicroscopic examination was normal in both eyes. Visual fields showed that she had a large centrocecal scotoma in the right eye. On ophthalmoscopic examination the fundus gave the picture shown in the Figure 5. Over the period of the next three months the condition waxed and waned without any subjective improvement. Soon after the delivery of the baby, the lesion in the right fundus rapidly cleared up with final acuity of 20/25 (6/7.5). Clinically, only a few whitish dots were left in the fundus.

Figure 6. A 74-year-old man came for evaluation of cataracts in his eyes. He did not have any other ocular or systemic complaint. The eye examination showed the visual acuity to be 20/40 (6/12) in the right eye and 20/30 (6/9) in the left. Only interesting changes were seen on slit lamp examination. He had, in addition to early posterior subcapsular cataracts, a groove of thinning of the cornea adjacent to the limbus that extended throughout the corneal circumference. This ringlike thinning had very distinct margins and was without any signs of inflammation (Figure 6). The patient had no symptoms and was utterly unaware of any change in his eyes other than the previously mentioned posterior subcapsular cataracts. The patient has shown no change in the corneal findings over a period of 11 year observation.

Ophthalmic "Past Pourri"

A Snapped Snap Judgement

The Judgement: "Cryosurgery is an innovation that is certainly here to stay in contrast to the integrated implant and the Ridley acrylic lens."

J.E. Lebensohn - 1966
Amer J Ophthalmol 62:177, 1966

The Snapping: "In cataract surgery, intraocular lens implantation is now the most popular procedure. In fact, probably 90 percent of the patients who have cataract surgery also receive intraocular lens implant."

J. Graham Dobbie, M.D. - 1986
Bulletin of the American College of Surgeons 71:23

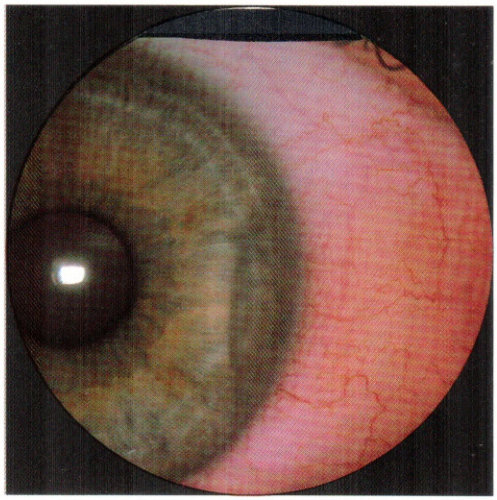

Figure 1

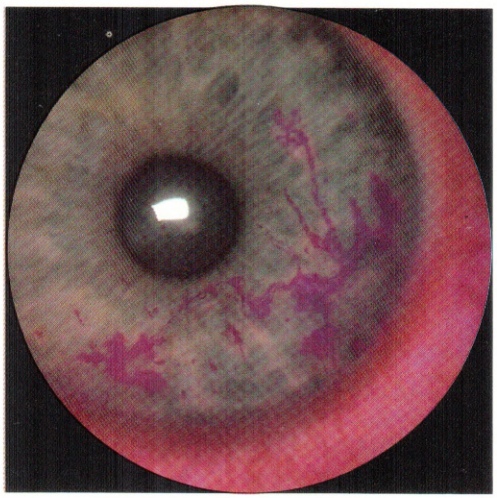

Figure 2

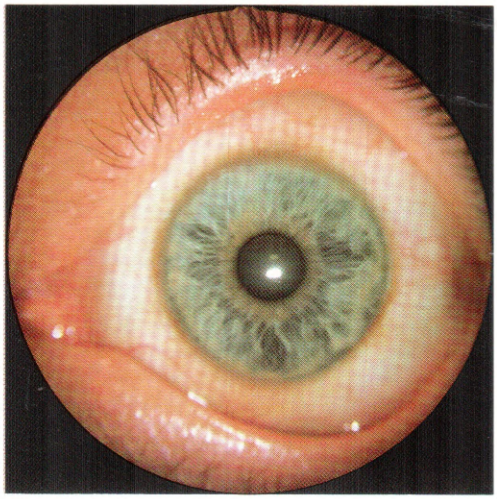

Figure 3

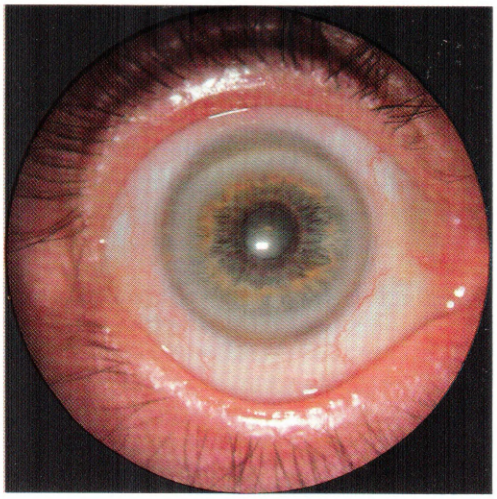

Figure 4

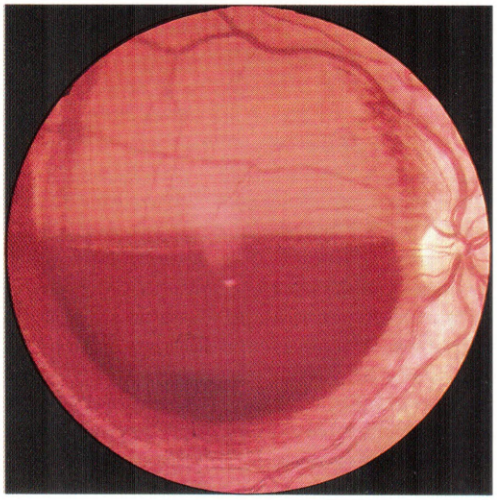

Figure 5

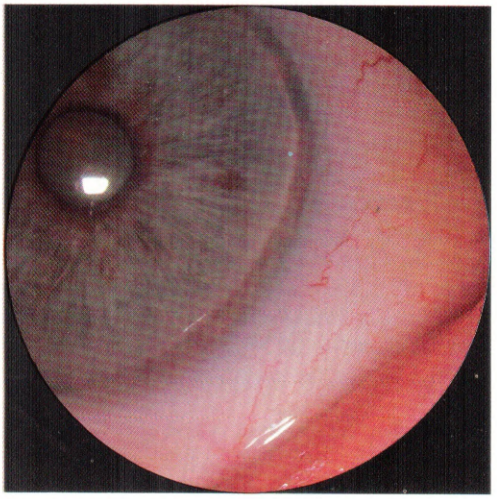

Figure 6

Clinical Manifestations

Retinal Vascular Tortuosity

Ahmad M. Mansour, M.D.

ABSTRACT: Retinal vascular tortuosity is a common finding in many ocular, genetic, and systemic conditions. However, little has been written to properly define normal from abnormal tortuosity, and to grade it according to some objective criteria. The author mentions the conditions associated with retinal vascular tortuosity and expresses a need for its objective quantitation. (Pak J Ophthalmol 2:48-49, 1986).

The term "tortuous" comes from the Latin "torquere" meaning a twist. The vascular system is uniquely tortuous, and the conjunctival and retinal areas are perhaps the best representation of it. This paper draws attention to the conditions associated with retinal vascular tortuosity. Retinal vascular tortuosity is divided into arterial or venous, involving small or large vessels, congenital or acquired, focal or diffuse, and associated with or without vascular dilation.

In 1884 MacKenzie[1] first described the association of retinal vascular tortuosity with hypermetropia. Thomas[2] attributed retinal vascular tortuosity in arteriolar sclerosis to weakening and stretching of the vessel wall. Many local and systemic conditions are associated with retinal vascular tortuosity. (Table) [1-38]

The retinal vessels are anchored at their entrance at the optic disc and at the arteriovenous crossing sites. Vascular congestion leads to dilatation of the vessel wall followed by tortuosity of the portion situated between the "anchor" sites. No varicosities exist in the retinal venous system. Various mechanisms that have been proposed to explain retinal vascular tortuosity include: 1-small eyeball size with normal vessel length; 2-increased venous pressure; 3-hypoxia; 4-high turnover flow; 5-tangential traction by preretinal tissues; 6-endothelial proliferation or vessel wall weakening.

The incidence of retinal vascular tortuosity is not know in the general population. Awan[3] found an incidence of 0.5% of pronounced isolated arterial tortuosity in his consecutive series of 2,100 patients. Gauss estimated the incidence of arterial tortuosity to be 15% and twice as common as venous tortuosity.[3]

Table
Conditions Associated With Retinal Vascular Tortuosity (Mansour)

SYSTEMIC	LOCAL
Achnodroplasia[24]**	Angioma of the retina[21]
Aging[2]	Arteriovenous communications of retina[32]*
Anemia[10]	Carbon monoxide retinopathy[34]
Arteriohepatic dysplasia[38]**	Coats's disease[30]
Atherosclerosis[2]	Congenital RVT[6]
Carotid artery stenosis[9]	High altitude retinopathy[33]
Carotid cavernous fistula[17]	Hyperopia[1]
Coarctation of aorta[13]	Juxtapapillary combined hamartoma[31]
Congenital heart disease[11]	Microphthalmos[14]*
Cyctic fibrosis[28]	Papilledema
Fabry's disease[19]*	Optic nerve vasculitis[23]
Familial dysautonomia[27]	Preretinal gliosis[8]
Fascioscapulohumeral dystrophy with cochlear hearing loss[36]**	Progressive familial retinal arterial tortuosity with spontaneous retinal hemorrhages[20]
Hereditary hemorrhagic telengiectasia[35]	Retinal venous occlusive disease[7]*
Hyperviscosity disorders[15]	Retinopathy of prematurity (retrolental fibroplasia)[16]
Maroteaux-Lamy syndrome[29]**	
Nonchromaffin paragan glioma[37]**	
Prematurity[12] (without ROP)	
Pulmonary emphysema and respiratory failure[22]	
Sickle cell disease[18]	
Velo-cardio-facial syndrome[25, 26]	

* In these conditions the tortuosity may be severe.

** The incidence of retinal vascular tortuosity is not significantly different than in the general population.

Henkind and Walsh[4] estimated the incidence of venous tortuosity and combined arterial and venous tortuosity to be respectively 2% and 6%. Besides the objective study of Awan,[3] the incidences of venous and combined retinal vascular tortuosity are still speculative and further work is underway to establish the incidence of retinal vascular tortuosity in the general population.

Tortuosity is graded as mild, moderate and severe.

There is no standard scale or schema available to help researchers in grading retinal vascular

Accepted for publication November 28, 1985.

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tortuosity. A qualitative method could be to compare fundi to 4 standardized fundus photographs, showing: no (1), mild (2), moderate (3), and severe (4) Tortuosity. Kagan, Aurell and Tibblin,[5] quantitatively graded tortuosity in terms of excess length by measuring the total length of vessels.

Retinal vascular tortuosity is at times the first reflection of an underlying disorder. The early recognition and prompt correction of which may be life-saving. Arterial tortuosity is usually congenital or associated with hyperopia, and venous tortuosity is usually acquired. Focal retinal vascular tortuosity should lead one to look for a local pathology. Family screening is helpful to delineate various syndromes (Fabray's disease, progressive arteriolar retinal tortuosity, hereditary hemorrhagic telengiectasia, and others).

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Ophthalmic "Past Pourri"

Without Rabbit's Foot?

When his several attempts in animal experiments failed, Chibret transplanted "the eye of a rabbit, under antiseptic precautions, into Tenon's capsule, of a girl of 17, whose staphylomatous eye had been enucleated." After this did not work, he resolved "that by repeated experiments he will find an eye better adapted for transplantation."

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Observations on New Techniques

Summary of Short-Term Results of the PERK Study*

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See Also Editorial on Page 40

ABSTRACT: The authors summarize the design and rationale for the National Eye Institute-sponsored Prospective Evaluation of Radial Keratotomy (PERK) Study. The purpose of the study was to evaluate the efficacy, safety, and stability of a single, well-defined technique of radial keratotomy. The diameter of the central clear zone was determined by the preoperative refraction. intraoperative ultrasonic pachymetry was used to measure the corneal thickness and a micrometer diamond knife was used to make the eight radial incisions in each case, the length of the blade being set at 100% of the thinnest of four paracentral corneal thickness readings. The authors summarize some of the results of the first year follow-up. (Pak J Ophthalmol 2:50-56, 1986).

The investigators in the National Eye Institute-sponsored Prospective Evaluation of Radial Keratotomy (PERK) Study[1] have published and presented results observed during the first year of follow-up in the study. More detailed descriptions of the rationale and design of the PERK study have been presented in other publications.[2,6,8] We summarize some of those results in this paper. We have summarized the contributions of others in the field of radial keratotomy in a separate publication.

BASELINE CHARACTERISTICS OF STUDY POPULATION

We studied one eye each of 435 patients.[7] At baseline, patient has a mean age of 33.5 years (SD = 7.28, range = 21 to 58), a sex ratio of 52% male to 48% female, a mean spherical equivalent cycloplegic refraction of -4.09 diopters (SD = 1.41, range = -2.00 to -8.00), and a mean refractive cylinder of 0.62 diopters (SD = 0.42, range = 0.00 to 1.50).

The patients' primary stated motivation for surgery was to see well without depending on corrective lenses (71%). Many of these patients expressed fear of losing their lenses in emergencies. Fewer patients expressed occupation (6%) or cosmetic (3%) reasons as their primary motivation for surgery.[9]

The physical and psychological health of subjects in the PERK study, as estimated by the preoperative psychometric questionnaire, was comparable to that of myopic individuals in the Rand Health Insurance Experiment.

REFRACTIVE RESULTS

Cycloplegic Refraction: The scattergram in Figure 1 presents the refraction at one year in all patients and the histograms in Figure 2 group the refractions by clear zone and outcome.

The operation reduced myopia in all eyes. The percent of eyes with a residual refractive error between +1.00 diopter and -1.00 diopter in each

Accepted for publication January 10, 1985.

Funded by the National Eye Institute Grant Nos. EY03761, EY03756, EY03755, EY03764, EY03753, EY03751, EY03767, EY04176, EY03752, and EY03765.

*Published with permission from Waring, GO: Short-term Results of the PERK Study. In Sanders, DR, Hofman, RF, and Salz, JJ (eds.): Refractive Corneal Surgery. Thorofare, SLACK, Inc., 1986, pp 313-346.

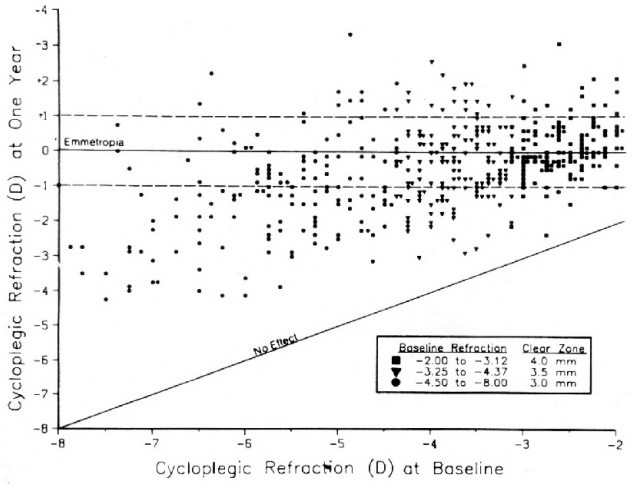

Figure 1: Scattergram displays the spherical equivalent of the cycloplegic refraction in diopters one year after radial keratotomy, compared to the refraction at baseline, in 411 eyes. The three symbols indicate the three baseline refraction groups (inset). Dotted lines indicate —1.00 and -1.00 diopters. (From Waring, et al: Results fo the Prospective Evaluation of Radial Keratotomy (PERK) Study One Year After Radial Keratotomy.)[1]

baseline group was lower = 84%, middle = 62%, and higher = 38%. The number of eyes overcorrected and undercorrected varied in the three groups. Undercorrections of more than 1.00 diopter occurred in 5% of the lower group, in 26% of the middle group, and in 56% of the higher group. Overcorrection of more than 1.00 diopter occurred in 11% of the lower group, in 12% of the middle group, and in 6% of the higher group (Figure 2). Clearly, the PERK technique was most effective in the lower and middle groups (-2.00 to -4.37 diopters). By reducing myopia, radial keratotomy will include the earlier onset of symptomatic presbyopia, especially in individuals who were left with hyperopic refractive errors--19% of our patients.

In each of the three groups, the final refraction was spread over a range of approximately five diopters (Figs. 1 & 2), variability that made it difficult to predict the exact outcome for an individual patient in spite of the use of a standardized surgical technique.

One way to anticipate the outcome for an individual patient's eye is to estimate the probability that the final refraction will fall within a specified range. For example, using the results of this study, one can say, "This eye has a baseline refraction of -2.50 diopters; with this technique it has about an 84% chance of having a refraction between +1.00 and -1.00 diopter one year after surgery," or "This eye has a baseline refraction of -2.50 diopters; with this technique it has about an 84% chance of having a refraction between +1.00 and -1.00 diopter one year after surgery," or "This eye has a baseline refraction of -6.00 diopters; with this technique, it has a 38% chance of being between +1.00 and -1.00 diopters and an 84% chance of being between +1.00 and -3.00 diopters one year after surgery." Expressing the anticipated outcome in confidence intervals is more meaningful than using more abstract statistical expressions, such as "r"[2].

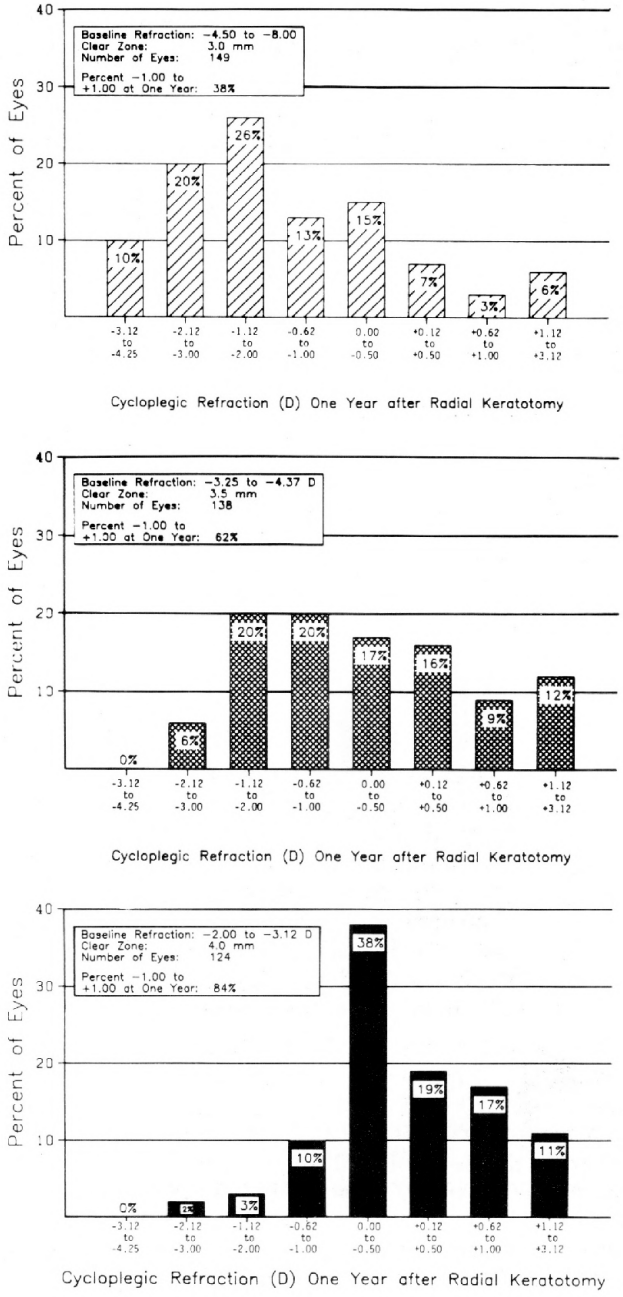

Figure 2: The spherical equivalent of the cycloplegic refraction in diopters one year after radial keratotomy in the three baseline refraction groups (insets): Above - lower group, center - middle group, and below - higher group. The height of the bars represents the percent of eyes in each range of refraction. The percent of eyes between —1.00 and -1.00 diopters is given in the inset. (From Waring, et al: Results of the Prospective Evaluation of Radial Keratotomy (PERK) Study One Year After Radial Keratotomy.)[1]

Astigmatism: An increase of 1.00 to 2.50 diopters of astigmatism occurred in 9.5% of the eyes, an undesirable outcome, while 2.0% of the eyes showed a decrease of more than 1.00 diopter. This probably resulted from either asymmetry of the eight incisions or interaction with the original astigmatism.

Uncorrected Visual Acuity: Figure 3 demonstrates the uncorrected visual acuity at baseline and one year for each of the three baseline refraction groups. At

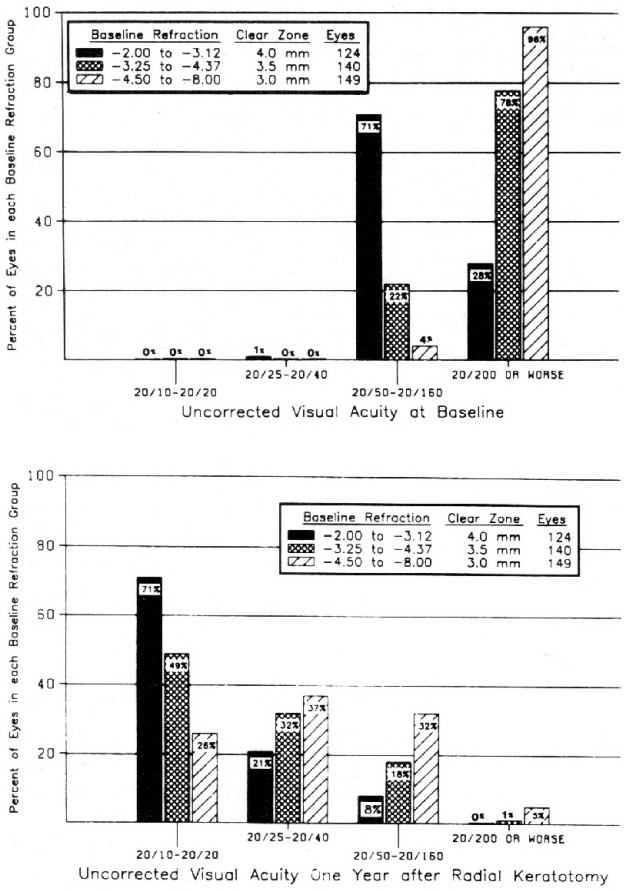

Figure 3: The uncorrected Snellen visual acuity at baseline (above) and one year after radial keratotomy (below). The three different bars in each range of visual acuity denote the three baseline refraction groups as indicated in the inset. The height of the bars represents the percent of eyes in each range of visual acuity. (From Waring, et al: Results of the Prospective Evaluation of Radial Keratotomy (PERK) Study One Year After Radial Keratotomy.)[7]

baseline, 69% of the eyes saw 20/200 or worse, with 48% unable to read the 20/200 line.

At one year, 20/40 or better uncorrected visual acuity as achieved by 92% of eyes in the lower group, 81% of eyes in the middle group, and 63% of eyes in the higher group. An uncorrected visual acuity of 20/200 or worse occurred in none of the lower group, 1% of the middle group, and 5% of the higher group.

Contrast Sensitivity Testing: Testing visual acuity with standardized Snellen charts measures visual function only for high contrast targets. the black letters against the brightly illuminated light box. Contrast sensitivity testing, on the other hand, tests visual function over a wide range of contrasts, conditions that better simulate those of daily living and better estimate overall visual function.

Contrast sensitivity testing was introduced into the PERK protocol at five centers after commencement of the study using 1) computer generated patterns presented randomly on a television screen and 2) patterns presented in random sequence on display cards.[10] The patients' pupils were undilated and they wore a clean spectacle correction.

There was not a statistically significant difference in the contrast sensitivity between the operated and unoperated eyes of 72 patients one year after surgery.[11] This study, however, involved only 17% of the total PERK population, so further studies of contrast sensitivity after radial keratotomy are needed to confirm these findings.

Central Keratometry and Refraction: The radical incisions resulted in a flattening of the central cornea, a reduction of its refractive power, and a reduction in the overall refractive power of the eye.[7] The average reduction in corneal power in the three baseline groups was: lower = 2.54 diopters, middle = 2.85 diopters, and higher =3.47 diopters, and the range of reduction in each group was--like the range of refraction--about five diopters.

The change in refraction was, on the average, greater than the change in keratometric power by 0.54 of a diopter (middle group) and 0.97 of a diopter (higher group). In the lower group, the change in refraction varied, on the average, from 0.58 of a diopter more to 0.30 of a diopter less than the change in keratometric power. In general the change in central corneal power and the change in cycloplegic refraction were linearly related, but the change in refractive power ranged from 3.75 diopters more to 1.50 diopters less than the change in keratometric power, suggesting that the changes in corneal topography were more complex than those measured by simple central keratometry.

Refraction and Visual Acuity: The uncorrected visual acuity for eyes with a specific myopi refractive error was often better after surgery than for eyes with the same refractive error at baseline. For example, the 56 eyes with a refraction of -2.00 to -2.50 diopters at baseline had a mean uncorrected visual acuity of a 20/125 (range: 20/40 to 20/200), but the 29 eyes with a refraction of -2.00 to -2.50 diopters one year after surgery had a mean uncorrected visual acuity of 20/60 (range: 20/30 to 20/125).

A wide range of visual acuity occurred for each refractive error. We compared the uncorrected Snellen visual acuity with the spherical equivalent of the cycloplegic refraction for 374 eyes whose refractive error ranged -3.00 D to +3.00 diopter one year after radial keratotomy.[12] For each refractive error, the range of visual acuity spanned approximately six Snellen lines, a great deal of variability. For example, eyes with a refractive error of -1.00 diopter had an uncorrected visual acuity that ranged from 20/15 to 20/50.

Corneal Topography: Photokeratoscopic pictures have been taken of corneas before and after surgery throughout the PERK study.[13] Their analysis is underway. One of the challenges in this area is to formulate a "shape factor" that describes the changes in corneal topography. This work is underway using image scanning techniques and computer graphic representatives.[14,15]

STABILITY OF REFRACTION AFTER RADIAL KERATOTOMY

During the first year after surgery, the refraction changed, presumably because the configuration of the cornea was unstable while wound healing was active (Figure 4).

Change During First Year After Surgery[16]: Between baseline and two weeks after surgery, all eyes became less myopic, with a range of change between 0.50 and 10.75 diopters. Between two weeks and three months after surgery, virtually all eyes lost some of the effect created by the surgery, the vast majority becoming 0.50 to 4.25 diopters more myopic. Between three months and six months and between six months and twelve months after surgery, the changes were similar, approximately 75% of the eyes changing less than 0.50 diopters, while most of those that were clinically unstable changed by 0.50 diopters or more became progressively less myopic (Figure 4).

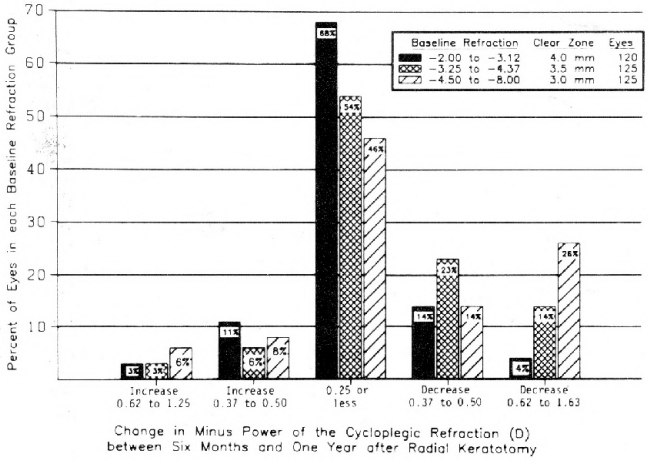

Figure 4: Bar chart indicates the change in the spherical equivalent of the cycloplegic refraction in diopters between six months and one year after radial keratotomy. The change is represented as the increase or decrease in minus power. The three different bars in each category denote the three baseline groups as indicated in the inset. (From Waring, et al: Results of the Prospective Evaluation of Radial Keratotomy (PERK) Study One Year After Radial Keratotomy.)[7]

It was not possible to predict the direction of change for individual patients. For example, a patient could become more hyperopic between three months and six months and yet become more myopic between six months and twelve months.[25]

Diurnal Variation: We found that many corneas are unstable one year after surgery, producing a moderate diurnal fluctuation in refraction and visual acuity.

We studied the diurnal changes that occurred in the manifest refraction, uncorrected visual acuity, and central keratometric power between 8:00 A.M. and 8:00 P.M. on the same day in a selected group of 63 patients who complained of fluctuation of vision.[17] The changes observed at three months after surgery and one year after surgery were similar.

From morning to evening, 42% of the 63 operated eyes showed an increase in minus power of the

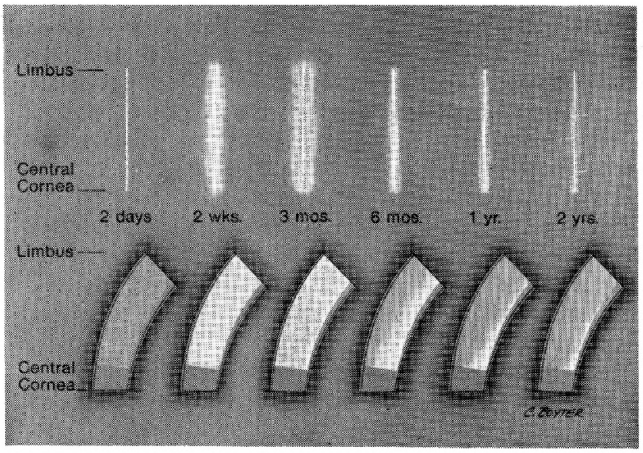

Figure 5: Natural history of the appearance of incisions two days to two years after radial keratotomy. At two days, the incision is present as a discrete line surrounded by faint edema. By two weeks, a diffuse, cloudy, gray haze surrounds both sides of the incision. By about three months, fine, discrete spicules appear within the cloudiness. By six months, the cloudiness has disappeared and the spicules appear more distinct imparting a feathered appearance to the incision. About this time, spicules begin to appear from the anterior and paracentral portions of the incision. At one year, the density of the spicules has diminished and they occupy primarily the deep portion of the incision. By two years, only a few discrete spicules extend from the incision, most in the deep stroma. (From Waring, et al: Slit Lamp Microscopic Study of Corneal Wound Healing After Radial Keratotomy.)[18]

refraction of 0.50 to 1.25 diopters, while only 2% of the eyes showed a decrease in the minus power of 0.50 diopters. In contrast, only 10% of the unoperated eyes changed by 0.50 to 1.00 diopters (average increase of myopia of 0.07 diopters).

The change in central keratometric power was similar, 35% of the operated eyes showing an increased corneal power of 0.50 to 1.25 diopters. The visual acuity changed by two Snellen lines or more in 76% of the operated eyes.

Appearance of Corneal Scars: The appearance of the corneal scars changed in a predictable way over the first three years after surgery, suggesting that the wounds were not completely healed during that time[18] (Figure 5). We think that the changes in the spicules adjacent to the incision correspond to the reorganization of the stroma and reflect persistent wound healing.

COMPLICATIONS OF RADIAL KERATOTOMY

Since radial keratotomy surgery is usually performed on structurally normal eyes that can be corrected to 20/20 or better with spectacles or contact lenses, the standards for safety should be high. Ophthalmologists should inform patients who are interested in radial keratotomy of the potential complications,[19] in both public information and advertising as well as in informed consent documents.

We divided postoperative problems into three groups: 1) transient signs and symptoms, 2) permanent signs and symptoms that did not reduce vision, and 3) complications that actually or potentially caused a persistent decrease in vision.

Transient Sequellae – Ocular pain occurred postoperatively, lasting 12 to 48 hours, seeming more severe with use of a pressure patch, and sometimes

requiring strong oral analgesics. Mild to moderate photophobia and conjunctival vascular dilation gradually decreased as the mild stromal inflammation and iridocyclitis disappeared over one to three weeks.

Vision commonly fluctuated in a diurnal pattern that became less noticeable between three months and one year, but persisted in some of the eyes at one year.[17]

Persistent Signs and Symptoms That Did Not Reduce Corrected Visual Acuity: Some phenomena that occurred after radial keratotomy were persistent and abnormal but usually did not reduce corrected visual acuity.

Undercorrection and overcorrection were undesirable sequellae, as was the induction of astigmatism, since the goal of surgery was emmetropia (Figures 1-2).

A study at one clinical center found that a stellate epithelial iron line (Figure 6) appeared in 86% of 75 corneas one year after surgery.[20] Another clinical

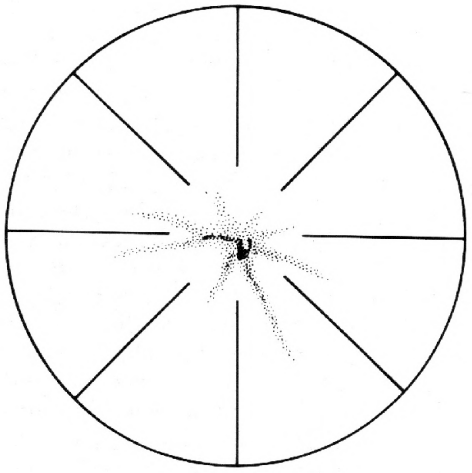

Figure 6: The stellate corneal epithelial iron line after radial keratotomy is located at the junction of the middle and inferior thirds of the cornea, sends branches out between the incision scars (The inferior branches are usually longer and more prominent than the superior ones), and varies from a faint, tan, horizontal line to a dense yellow-brown deposit with eight radiating arms. (From Waring, et al: Stellate Iron Lines in the Corneal Epithelium Following Radial Keratotomy Surgery.)[20]

center reported a lower incidence.[21] The changes in corneal topography--flattening of the central cornea and slight depression of the cornea between the radial scars--were probably the basis for the formation of an iron line.

Abnormal deposits, including oval epithelial inclusion cysts and small foreign bodies, appeared in about 7% of the scars, the low incidence reflecting the careful irrigation of wounds at the conclusion of surgery. Blood vessels grew into 1.5% of the incisions, none more than 1 mm.

Complications That Actually or Potentially Decreased Best Corrected Visual Acuity: At baseline, all patients saw 20/10 to 20/20 with their best manifest refraction. At one year, three eyes (0.7%) could not be corrected to at least 20/20. (Two of these could be corrected to 20/25 and one to 20/30.) However, 13% of eyes lost one or two lines of best corrected acuity,

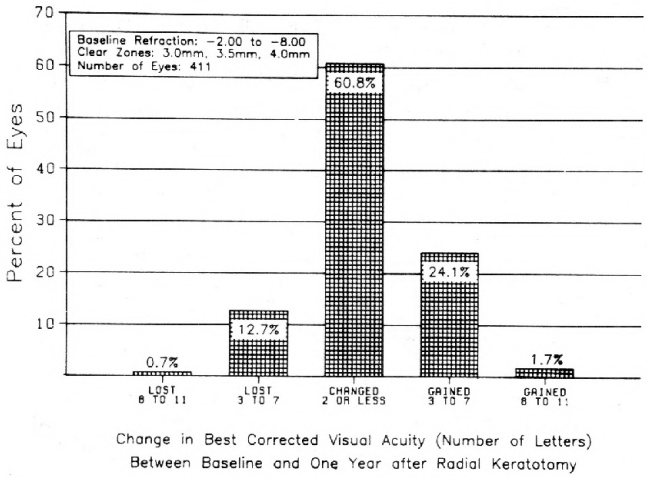

Figure 7: Bar chart indicates the change in best corrected visual acuity between baseline and one year after radial keratotomy. The height of the bars represents the percent of eyes in each category. On the visual acuity chart, each line contained five letters. A change of three to seven letters represented a change of one Snellen line. A change of 8 to 12 letters represented a change of two Snellen lines. (From Waring, et al: Results of the Prospective Evaluation of Radial Keratotomy (PERK) Study One Year After Radial Keratotomy.)[7]

compared to baseline levels (Figure 7). Any loss of vision from surgery on a previously normal eye is undesirable, but the severity of loss in this study was not great.

Corneal Perforations: Nine (2.29%) eyes had a single corneal perforation during surgery.[7] None was large enough to require suturing or termination of surgery, but one leaked for five days. This low perforation rate was achieved by setting the diamond knife blade at 100% of the thinnest paracentral corneal thickness reading as measured by calibrated intraoperative ultrasonic pachymetry (speed of sound, 1640 meters/sec), and by not attempting to deepen the incisions after the first pass of the knife. The low perforation rate enhanced the safety of the procedure.

Glare: The clinical glare tester used in this study was designed to detect disability glare and was not sensitive enough to detect small amounts of glare.[22] No patients were found to have disability glare with this device, although three reported glare symptoms that disrupted their driving.[7]

The glare index generated from the psychometric test demonstrated no significant increase in light sensitivity between baseline and one year. Interestingly, glare was reported on the psychometric questionnaire by approximately one third of the patients at baseline and one third to one half of the patients at one year; we think most off these individuals are describing nondisability types of glare.

Patients with a smaller diameter clear zone experienced more glare than patients with the larger diameter clear zone.[23]

We are presently devising a more sensitive method of measurng glare, using contrast sensitivity targets against a glare source, to try to quantitate the mild glare that patients report both before and after radial keratotomy.

Changes in Epithelial Basement Membrane and

Epithelial Erosions: Changes in the epithelial basement membrane were studied in 71 eyes at one PERK center.[24] Corneal epithelial opacities similar to those seen in epithelial basement membrane dystrophy appeared in 46.5% of eyes after surgery. They had a map-dot-like configuration over less than one eighth of the corneal surface and tended to be transient, persisting less than three months in 75.3% of the eyes. Three of the eyes had changes that persisted for twelve months. One eye had visual blurring attributed to the basement membrane changes, but there were no episodes of recurrent epithelial erosion.

Four patients experienced symptoms of corneal epithelial erosion, three associated with epithelial basement membrane map-shaped changes. These occurred one to seven months after surgery and disappeared after topical therapy, except in one patient who required treatment with a therapeutic soft contact lens that induced the growth of subepithelial blood vessels in five incisions. This patient was excluded from the results because she wore a contact lens immediately after surgery.

Endothelial damage – Long-term studies of the corneal endothelium in the PERK study have not been completed. Preliminary studies at one clinical center employing wide-field specular microscopy in 15 patients, six to twelve months after radial keratotomy, compared the cell density centrally and in the area under the radial keratotomy scars.[25] There was no significant difference in the cell density in these two areas.

The endothelial cells between and beneath the corneal incisions should be studied and sensitive methods of measurement, such as individual cell area, and morphometric variables, such as the number of hexagonal cells, are more likely to detect subtle but significant damage to the corneal endothelium.

Severe Complications: In the PERK study, we found no severe potentially blinding complications during the first year after surgery, such as those reported by others: cataract formation,[26,27,28] bacterial keratitis,[29] endophthalmitis,[30] or traumatic rupture of the globe.[31]

PATIENT SATISFACTION

We studied the patients' satisfaction one year after surgery by administering a psychometric questionnaire and deriving a satisfaction index based on their response to selected questions. Definite differences in satisfaction existed among the patients one year after surgery: 48.5% of the patients were very satisfied, 40.2% of the patients were moderately satisfied, and 11.3% of the patients were dissatisfied.

Those patients with good visual acuity and minimal refractive error were more satisfied, and the satisfaction tended to decrease as the uncorrected visual acuity declined and the residual refractive error increased. Problems with glare and fluctuating vision also reduced satisfaction. The wide range in satisfaction may reflect not only the variability in outcome, but also the patients' past visual history, motivation for seeking surgery, and the extent to which their expectations were realized.

VARIABLES THAT AFFECTED THE OUTCOME OF RADIAL KERATOTOMY

It has been known for almost 100 years that radial keratotomy flattens the central cornea and reduces myopia; the PERK study--along with others--has documented this finding. However, the amount of reduction varied greatly from one patient to another so that the outcome could not be predicted accurately for an individual patient. Beginning with Fyodorov, researchers have systematically attempted to identify and quantify those factors that affect the outcome of the surgery, including both patient characteristics that cannot be modified by the surgeon, such as age and corneal curvature, such as the number and depth of incisions and the diameter of the clear zone.

We examined the effect of several factors on the outcome of radial keratotomy one year after surgery in the PERK Study.[32] On the average the smaller the central clear zone the greater the change in refraction, but there was considerable variability in each of the three clear zone groups, and some eyes that received a different diameter clear zone had the same outcome. Eyes with a greater amount of myopia tended to have a greater effect from the surgery if the clear zone was the same, although the amount of change was variable for any given refractive error. We divided patients into three age groups and found that increasing age is associated with reduction in myopia. Older males have a greater change in refraction than older females, but we found no difference by sex in younger patients. Patients with relatively shallow incisions have less change in refraction. However, among patients with deeper incisions, there is a wide range in the change in refraction.

We found little relationship between the change in refraction and average central keratometry, corneal diameter, preoperative intraocular pressure, ocular rigidity, or corneal thickness.

To examine the combined effect of these factors we did a multiple regression analysis. We used the best subset selection method to search for models that best explain the variability in outcome and chose the model that included baseline refraction, age, and depth of incision. The regression equation is: Change in refraction = 1.69 - 0.48 (Baseline Refraction) + 0.05 (Age) + 0.02 (Depth). The R^2 value is .45, indicating that 45% of the variation in outcome can be explained by considering these factors. In the PERK study, the diameter of the clear zone was determined by the baseline refraction.

A more meaningful way to use regression analysis in predicting the outcome is to indicate how confident we are that the patient's final refraction will be within a given range. If one is 95% confident that the patient will be within a given range, the range is known as the 95% confidence prediction interval. The amount of unexplained variability in the regression model results

in a prediction interval about 4.00 diopters wide.

Thus, the average response is affected by several factors, most notably baseline refraction (diameter of the clear zone), age, and depth of scar. However, the response of an individual patient is highly variable and the precision with which we are able to predict individual patient response from the PERK technique of radial keratotomy surgery is ± 2 diopters.

FUTURE STUDIES

In addition to providing basic information about changes in refraction, visual acuity and stability during a five year period, a number of ancilliary studies will emerge from the PERK Study. In addition to those reviewed in this chapter, topics will include differences in outcome between two eyes of the same individual, the effect of re-operations, the precision of estimating the depth of incision scars with the slit-lamp, more sensitive methods of detecting glare, analysis of contrast sensitivity function, experience with wearing of contact lenses after radial keratotomy, study of patients who elect to have only one eye operated on, changes in astigmatism, effect of steroids on outcome, occurrence of ptosis after surgery, preoperative versus intraoperative pachymetry, comparison of different methods of measuring corneal thickness, and the like.

The PERK Study is funded to provide a five year follow-up on the 435 eyes entered into the core surgical group, which represents intermediate term information. The initial PERK grant request contained a proposal for long-term follow-up that would consist of periodic re-examination of these patients every five years, and it is hoped that funding of some long-term follow-up program will be forthcoming.

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Camera Clinicals: Expositions

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Figure 1

Corneal Burn From Formaldehyde Solution

ABSTRACT: Ocular injuries from formaldehyde solution used in histology laboratories are rare. A 27-year-old man splashed a drop of solution of formaldehyde in his eye. It caused coagulation and sloughing of superficial layers of corneal stroma in a saucershaped area. Complete recovery followed in five days. Immediate and thorough washing of the eye after this trauma may save the sight. (Pak J Ophthalmol 2:46, 47, and 57 1986).

Formaldehyde (HCHO) is a pungent suffocating and powerfully antiseptic gas used as a room disinfectant and for fixing histological specimen in its 10% to 40% water solution called formalin. Depending on its concentration in air in gaseous form, it has been shown to cause problems ranging from tearing and discharge to serious necrotic corneal lesions in experimental animals.[1] It is interesting that the eye irritation caused by smog has also been attributed to the very low concentrations of formaldehyde in it.[2]

Ocular injuries caused by a splash of 40% solution of formaldehyde may cause serious damage. In one report two workmen unwittingly provided a controlled study for the value of immediate washing of the eyes following this injury. Both of them accidentally sprayed 40% solution of formaldehde in their eyes. One did not washed his eyes; the other immediately did. In the former, both eyes were lost despite all treatment including repeated keratoplasty; in the latter, one eye eventually cleared and the other developed opaque vascularized cornea.[3] Severe glaucoma may also develop after this injury.[3]

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Figure 2

Dendritic Keratitis Following Cardiac Bypass Surgery

ABSTRACT: Three men, ages 59- to 71-year, developed extensive dendritic keratitis six to 12 weeks following cardiac bypass surgery. One of them also had labial and nasal involvement. These patients either were or have been on systemic corticosteroids. Patients who undergo major cardiac surgery should be watched for herpetic keratitis. (Pak J Ophthalmol 2: 46, 47, and 57, 1986).

Herpes virus, an organism that is dermotrophic in man and neurotrophic in animals, is 100 to 150 micron in size, and has man as his only natural host.[1] The virus is stable at 90°C in dry state, but loses this ability at isotonic concentrations.[2] As a rule, Type 1 herpes virus is responsible for ocular lesions, and Type 2 causes genital herpes. The incubation period of herpes simplex infection ranges from 2 to 12 days. The primary herpes simplex infection incidence reaches 90% to 100% by the age of 15.[1,3] In half of the infected people the primary infection may remain asymptomatic. The usual clinical manifestations of primary infection are gingivostomatitis, upper respiratory lesions, cutaneous involvement, and ocular inflammation. All of these are accompanied by regional lymphadenopathy. The primary infection usually clears without sequela. The recurrence of herpes simplex in the eye is the single most frequent cause of corneal opacities in Western countries.[1,3] The corneal lesion initially takes a typical dendritic appearance and can be clearly demonstrated by rose bengal (Figure 2) or fluorescein staining.

The recurrences of herpes simplex disease are associated with fever (such as malaria), tiredness, cold wind, stress, menstruation, or minor trauma.[1,2] In our patients the stress of major surgery and debilitating factors associated with severe cardiac disease obviously were responsible for the recurrence and great severity of it. It is important that patients who undergo cardiac and other major surgical procedures be kept under observation for a timely detection of herpetic disease of the eyes.

The principles of treatment of ocular herpes simplex infection include: 1. destruction of the free virus by iodine or ether; 2. elimination of the infected cells by removal of the affected corneal epithelium; 3. prevention of the replication of the intracelluar virus by antiviral agents like idoxuridine (IDU), adenine arabinoside (Ara-A or Vira-A), and trifluridine or tryfluorothymidine (Viroptic); and 4. supportive nonspecific therapy including cycloplegia, aspirin, and patching of the involved eye.[4]

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Figure 3

Bilateral Limbal Melanosis Mistaken as Kayser-Fleischer Ring

ABSTRACT: Bilateral melanosis limited to the limbus in the shape of a sharply defined ring in a 30-year-old white man was mistaken as Kayser-Fleischer ring. The lesion has been observed without any change for many years. Unilaterial primary benign acquired melanosis of the conjunctiva is seen most often in whites, but the bilateral form is by far the most frequent in blacks and other nonwhite races. The patient had no systemic or local toxic or metabolic disorders that could induce this pigmentation. (Pak J Ophthalmol 2:46, 47 and 58, 1986).

The excessive pigmentation of the conjunctiva or melanosis may be congenital or acquired. The congenital lesion involving the eye alone is called melanosis oculi or ocular melanocytosis. If ocular melanocytosis is accompanied by ipsilateral pigmentation of deep dermal tissues, the condition is named oculodermal melanocytosis or the nevus of Ota. Both ocular melanocytosis and oculodermal melanocytosis are subepithelial changes. The changes in the epithelium itself are called ephelis or freckle. The acquired melanosis is an epithelial process that may be primary or secondary to diverse pathologic conditions. The secondary melanosis is most frequently observed in nonwhite races. The primary acquired melanosis is commonly seen in pigmented races as a bilateral condition and in whites as a unilateral condition.[1] The bilateral occurence of benign acquired melanosis in this white patient is unusual. Some authors favor the term "atypical melanocytic hyperplasia" for these changes.[2]

The importance of conjunctival melanosis resides in the fact that precancerous or malignant changes may appear in pre-existing acquired pigmentation. Such transformation, however, is very rare.[1] Reese[3] pointed out that the location of pigment in the epithelium may be confirmed by slit lamp examination and that melanin pigment that is too light to be discerned by ordinary light may be seen in its full extent by ultraviolet illumination. Acquired ocular melanosis may regress without treatment. However, it is best to biopsy the area showing most alteration in a lesion suspected of being precancerous.

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Figure 4

Arcus Juvenilis

ABSTRACT: A 31-year-old man had most dramatic changes in his corneas like those seen in the elderly as arcus senilis. Serum lipids and cholesterol were normal, and no xanthalasma or other ocular changes were present in the patient. Family history was negative for arcus juvenilis. (Pak J Ophthalmol 2:46, 47, and 58, 1986).

Arcus senilis has been considered a degenerative condition of the peripheral cornea in the past and at various times regarded as a fatty, hyaline, or calcareous degeneration.[1] However, Cogan and Kuwabara[2] found no necrosis or atrophy, which are prerequisites of degeneration, in their histopathologic and histochemical studies. Now arcus senilis is considered merely an age change in which cholesterol and phospholipids deposition takes place in the periphery of the cornea without loss of function or structural morphology. The change first begins adjacent to Descemet's membrane and then at the Bowman's membrane's level. Except in very marked cases the arcus is separated from the limbus by a clear zone. Cogan and Kuwabara[2] found a similar deposition of cholesterol and lipids in the perilimbal sclera. They think the sparing of the clear area and limbus is due to the vascularity in this area. Usually the mid stroma is less extensively involved, giving the arcus an hour-glass appearance in its anteroposterior section.

Arcus senilis usually appears after the age of forty. However, in some instances it may be seen in younger individuals when it is called arcus juvenilis. In some of the patients with arcus juvenilis systemic changes of familiar hyperlipidemia have been found.[3] In this latter group, xanthomas of the tendons and xanthalasma of the eyelids may be present. The treatment of familial hypercholesterolemia (hyperbetalipoproteinemia) may be helpful in regression of xanthomatous lesions.

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Figure 5

Massive Preretinal Hemorrhage In Pregnancy

ABSTRACT: A 23-year-old woman developed a massive preretinal hemorrhage in her right eye during the second trimester of her pregnancy. The hemorrhage kept waxing and waning during the pregnancy, but completely resolved after the childbirth with final visual recovery to 20/25 (6/7.5). The occurence of such preretinal hemorrhages in pregnancy is rare. The author thinks the hemorrhage might be related to the hemodynamic changes associated with pregnancy. (Pak J Ophthalmol 2:46, 47, and 59, 1986).

Preretinal hemorrhages in otherwise normal eyes are rare. They are usually seen in the central retina involving the macular area, and are 1–2 disc diameter in size. They produce a positive scotoma with severe loss of sight, but fortunately have excellent prognosis.[1] Depending on their size, these hemorrhages disappear in several weeks to months with no loss of vision, sometimes leaving behind a white delicate line representing the border. The sources of these hemorrhages are the retinal or peripapillary capillaries in normal eyes and the neovascular capillaries in proliferative diabetic and other vascular retinopathies. The hemorrhages usually detach the internal limiting membrane of the retina and lie between the retina and this membrane. In most instances, the layering of the blood elements due to the force of gravity takes place with red blood carpuscles settling at the bottom and the clear serum at the top, known as "boat-shaped" hemorrhage. Sometimes the hemorrhage may break through the internal limiting membrane and lie directly under the vitreous, called "subhyaloid" hemorrhage. If the examiner can see Gunn's dots of the internal limiting membrane, the hemorrhage is not subhyaloid.

The occurence of huge preretinal hemorrhage in pregnancy is interesting. The development of central serous choroidopathy in pregnancy has been previously recorded on rare occasions.[2] It appears that alterations in the hemodynamics of circulatory system, expansion of vascular channels, and the increase in the blood volume seen in pregnancy[3] may be related to these ocular changes in pregnancy. It is to be remembered that preretinal hemorrhages may be associated with cerebral hemorrhages following head injuries.[4]

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Figure 6

Senile Marginal Degeneration of Cornea

ABSTRACT: A 74-year-old man had most dramatic deep annular groovelike formation in the periphery of both corneas. There were no symptoms and the vision was unaffected. The condition has remained unchanged over the observation period of 10 years. (Pak J Ophthalmol 2:46, 47, and 59, 1986).

Marginal degeneration, also known as Terrien's disease, senile marginal degeneration, or Fuchs's degeneration, was first described by Terrien[1] in 1900. He thought the condition was a dystrophy, but later authors, including Fuchs,[2] have regarded it as degeneration.

The etiology of this condition is not known. It occurs mostly after the age of 50, but may be occasionally seen in young persons.[3] In seventy-five percent cases the afflicted person is a male. Typically the condition insidiously begins in the upper cornea as a non-inflammatory process with thinning of the corneal stroma to form a gutter-like furrow that with time surrounds the whole corneal periphery like a ring. The irregularity in the curvature of the cornea may produce astigmatism. Throughout this the affected eye remains free of pain. Corneal ectasia and, on rare occasions, perforation of the cornea may occur. This unfortunate circumstance may lead to the loss of eye.[4] Pathologically the degeneration originates in the corneal stroma, which is gradually replaced by a thin fibrovascular layer that separates the epithelium from Descemet's membrane.[4]

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Original Article

Prognosis and Management of Perforating Ocular Injuries*

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and
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ABSTRACT: Out of a total of 46 consecutive perforating eye injuries, 10 (22%) involved only cornea (Group 1); 14 (30%) involved corneosclera (Group 2); six (13%) involved cornea or corneosclera with lens trauma (Group 3); nine (20%) involved cornea, sclera, lens and/or vitreous (Group 4); and seven (15%) were anteroposterior double perforations (Group 5). Sex incidence was 41 men and five women. Three perforations, all in women, were from blunt fist trauma. The ages of patients ranged from five to 59. Twenty-six (57%) eyes had intraocular foreign bodies. Final visual acuity of 20/40 (6/12) or better was achieved in nine (90%) eyes in Group 1; in 12 (86%) in Group 2; in four (60%) in Group 3; in 3 (33%) in Group 4; and in five (71%) in Group 5. The followup period ranged from one to 10 years. Five eyes (5%), three with bacterial endophthalmitis, one with epithelial downgrowth, and one with severe disorganization, were enucleated. The authors make the following recommendations: 1. Large perforations should be repaired with a "step by step exploration and suturing" technique starting from one end. 2. Injuries involving more than one major structure should be managed by a carefully planned multi-stage microsurgical approach instead of an overaggressive handling in one sitting. 3. Because of an increased tendency in them to form aqueous fistulas, all peripheral corneal perforations should be sutured and repeatedly checked for postoperative leaks. 4. For a foreign body caught in a corneal perforation and projecting into the anterior chamber a deep keratotomy incision should be made adjacent to the perforation and the foreign body dislodged with a needle tip passed along it. 5. One must be aware that intralenticular foreign bodies cannot always be successfully removed by intracapsular cataract extraction. 6. Vitrectomy is an important advance in the management of severe ocular perforations. The timing of vitrectomy should be determined by closely monitoring the condition of the eye following initial repair. 7. If during the first few postoperative hours the eye keeps losing its clarity, it is probably infected. The authors consider infection the most serious complication of perforating injury. (Pak J Ophthalmol 2:60-65, 1986).

The great variability in the shape and severity of perforating injuries of the eye makes is impossible to devise a set method for their management. The poor predictability and great diversity of complications that follow such injuries do not often permit any definite prognosis. The obvious differences in the skill and experience of various authors renders their conclusions on the management and prognosis of perforating injuries limited in value for general application. There is no doubt, however, that modern advances have significantly improved the prognosis for perforating injuries involving the anterior segment.[1] Over the period of the last few years, the prognosis for penetrating injuries involving the posterior segment has also shown an encouraging improvement.[2] The purpose of this paper is to present the management and prognosis of 46 consecutive cases of perforating injuries of the eye and to make recommendations based on the experience of the authors for the surgical treatment of such trauma.

MATERIALS AND METHODS

Forty-six consecutive cases of perforating injuries of the eye were classified into stepladder groups shown in Table 1. The preoperative evaluation of all of the patients included documentation of cause, site, shape, and extent of injury, structures involved, investigations for intraocular foreign body detection and its location by x-rays in primary, up, down, right, and left gazes from anteroposterior and lateral views, and ultrasonography, and time of trauma. The final

Accepted for publication February 14, 1986.

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*Funded by the Pakistan Academy of Medical Sciences.

TABLE 1
Types of Perforating Injuries (46 Cases)*

Classification	Structures involved	No. of Cases
Group 1	Corneal perforation with or without iris prolapse	10 (22%)
Group 2	Combined corneoscleral perforation with or without uveal prolapse	14 (30%)
Group 3	Cornea or corneoscleral perforation with lens perforation	6 (13%)
Group 4	Corneal, scleral, or corneoscleral with lens and/or vitreous perforation	9 (20%)
Group 5	Double perforating injury	7 (15%)

* 34 men and 7 women, 5-to-59-years in age.

disposition and function of each treated eye was recorded.

The corneal and corneoscleral perforations were repaired by microsurgical technique. Attempts were made in all cases to reposit the prolapsed uveal tissue. In eyes with perforation of the anterior lens capsule, no attempt was made to irrigate the anterior chamber unless free cortex was seen in the anterior chamber. In eyes where the lens was perforated through and through, a similar approach was used when vitreous had not extensively herniated into the anterior chamber. Other than the central self-sealed perforations, all corneal perforations over the size of 2 mm were carefully sutured with 10-0 nylon. If the lens became opaque during the postoperative period, it was extracted by a well-planned second stage procedure. All of the cases with multiple structure involvement were handled by carefully planned multiple procedures.

Large perforations with prolapsed tissues or retained foreign bodies were closed by a "step by step exploration and closure" technique. Instead of complete exposure and exploration of the wound, or the dislodging of the foreign body from it, one end of the wound was cleaned, the prolapsed tissues reposited, and the cleaned part of the wound carefully sutured before the area adjacent to this was similarly explored and repaired. In cases of a foreign body in the wound, the foreign body was gently dislodged from one end of the wound and sutures placed in it and tied. The step by step removal of the foreign body and the closure of wound was continued till the wound was completely closed and the foreign body removed without any further loss of intraocular contents. The wound closure was followed by cryoapplication around it in cases of scleral perforations. This technique was used in five patients, two of whom had hemispheric scleral perforations from blunt (fist) injury. To remove the foreign body that was trapped in the corneal perforation and was projecting into the anterior chamber, a linear incision was made from the one end of the perforation itself to extend outward in the fashion of a radial keratotomy incision. A needle tip was passed horizontally deep in this keratotomy and the foreign body engaged on its tip and flipped out. Once dislodged the foreign body was forced out of the wound by the outward gushing of the aqueous. In three such cases this method dislodged the foreign bodies without entering the anterior chamber or injury to its structures.

The intraocular foreign bodies in the anterior chamber were removed either by extension of the original wound of entry or a fresh limbal incision. If the foreign body was closer to the pupil than to the chamber angle, it was first brought in the angle by a magnet or by direct manipulation through a small watertight wound. Healon or air was injected into the anterior chamber to maintain its depth. The foreign bodies in the vitreous cavity were removed by pars plana approach if anterior to the equator, or by scleral localization of the intraocular foreign body and direct scleral incision at that site if posterior to the equator. Four patients with retained intraocular foreign bodies

TABLE 2
Management and Final Outcome (46 Cases)

Injury Type	Management	Final result
Group 1 (10 Cases)*	3-selfsealed (all central)	9-20/40 or better (90%)
	7-sutured with 10-0 nylon (2 postoperative leaks repaired)	1-Enucleated†
Group 2 (14 Cases)*	All repaired with 10-0 nylon (prolapsed tissue reposited or excised)	12-20/40 or better (86%) one-20/50 one-20/200 or less
Group 3 (6 Cases)**	1st stage: Wound repair and irrigation of anterior chamber 2nd stage: removal of the cataract (in 2 patients the lens remained clear except for localized opacity.)	4-20/40 or (2 phakic and 2 apkakic) (66%) 2-20/200 or less (33%)
Group 4 (9 Cases)	5-1st stage repair with excision of prolapsed vitreous where indicated; 2nd stage cataract extraction with anterior vitrectomy 3rd stage ret. det. repair (3)	3-20/40 or better (33%) 2-20/200 less (22%)
	4-Enucleations (3 due to endophthalmitis, one due to severe disorganization)	Lost (44%)
Group 5 (7 Cases)***	All-Repair of entry wound 4-Foreign body removed 2-Delayed and 2 early vitrectomy 2-Scleral buckling	5-20/40 or better (71%) 1-20/50 (14%) 1-light perception (14%)

* Out of combined 24 cases in Groups 1 and 2, 15 had intraocular foreign body.

** Out of six cases in Group 3, one had intralenticular foreign body.

***Out of combined 16 cases in Groups 4 and 5, 10 had intraocular foreign body.

† This patient had not sought medical advice till epithelial downgrowth through a simple corneal perforation had extensively invaded the anterior chamber.

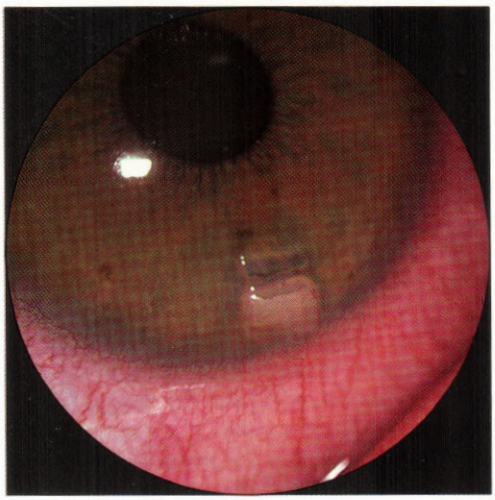

Figure 1. (Awan & Humayun): Corneal perforation from a broken glass jar. The tonguelike edge of Cornea was mistaken as a piece of glass by her doctor.

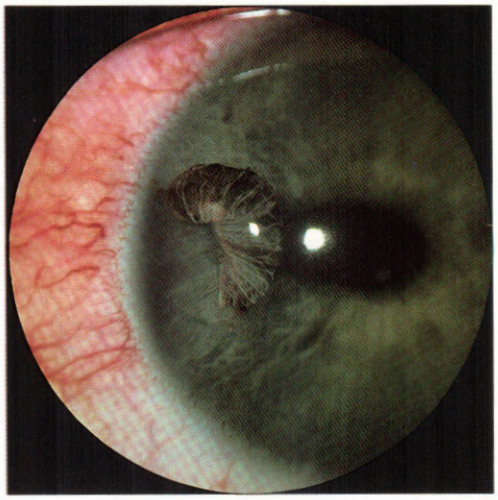

Figure 2. (Awan & Humayun): Corneal perforation with iris prolapse. It was completely reposited.

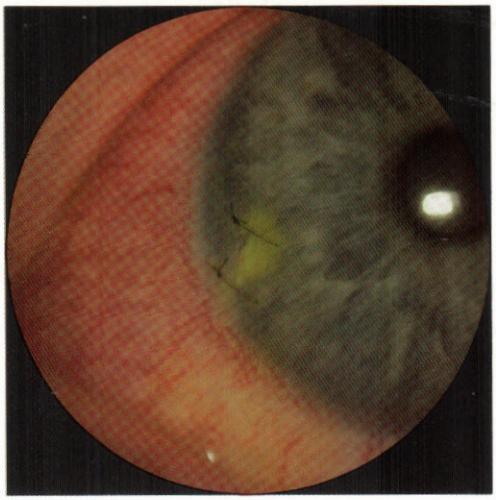

Figure 3. (Awan & Humayun): Fluorescein test demonstrating a leak in a peripheral corneal perforation two weeks after repair.

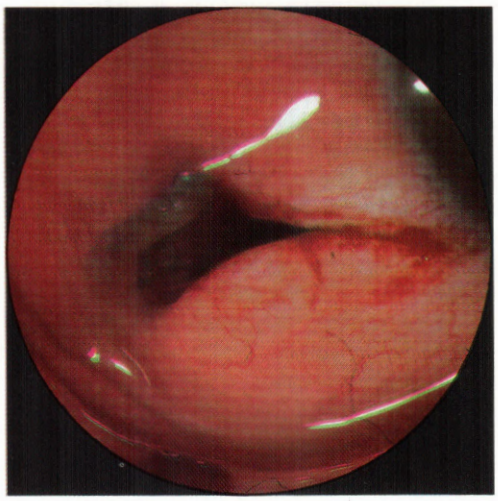

Figure 4. (Awan & Humayun): An extensive perforation with a large metallic foreign body in it. It was successfully repaired and foreign body removed using the "step by step exploration and suturing" technique of the authors.

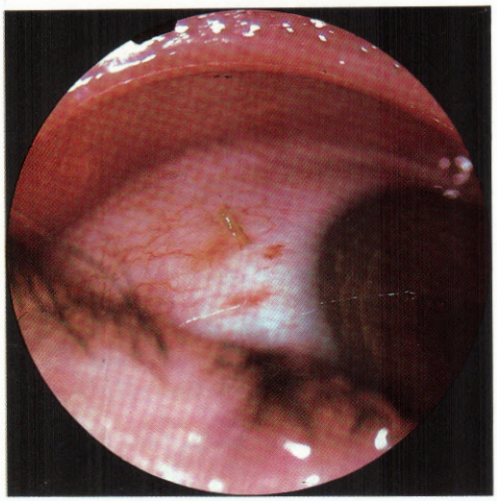

Figure 5. (Awan & Humayun): A splinter of wood perforating the sclera.

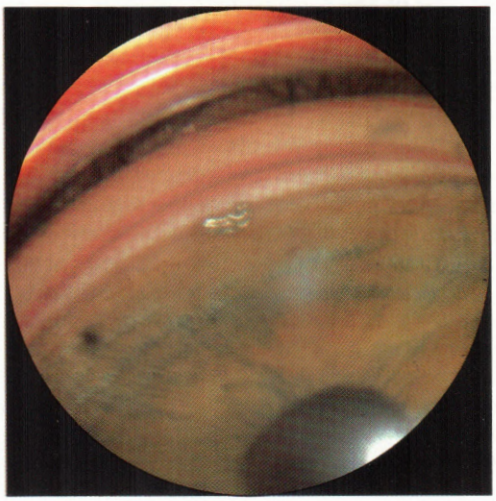

Figure 6. (Awan & Humayun): An aluminum foreign body that postoperatively migrated from the posterior into the anterior chamber nine years after the initial injury and its repair.

(one glass, one aluminum, and two iron) refused their removal. An intralenticular foreign body in one case was left alone till the lens became opaque. This foreign body was removed with the extracapsular extraction of the cataract.

All patients were treated by multi-stage approach except one in whom corneal, uveal, lenticular, and anterior vitreous trauma were handled in one sitting. All patients had the preventive measures of tetanus toxoid injections, cryoapplications around the scleral wounds after repair, cultures for pathogens and sensitivity, prophylactic local and systemic antibiotics, local and systemic corticosteroids in cases with lenticular and vitreous involvement, and a fluorescein test for preoperative or postoperative leakage of wound.

RESULTS

An outline of the type of injury, its management, and results are given in Table 2. All except two foreign bodies were successfully removed. Three patients had perforation of the globe from a fist blow, all of these were women. In one of these with a neglected clear corneal perforation, the eye was enucleated because of extensive epithelial ingrowth. Three more eyes from Group 4 were enucleated because of severe endophthalmitis.

Of the 10 clear corneal perforations (Color Figures 1 and 2) in Group 1, three had self-sealed. In two peripheral corneal perforations, leakage was found with a fluorescein test two to three weeks later, despite deep anterior chambers and normal visual acuity (Color Figure 3). These leaks required repair. The "step by step" repair of five cases with large perforations (Color Figure 4) gave successful anatomical and visual results 20/40 (6/12) or better acuity.

In Group 1 and Group 2, all except one patient attained 20/40 (6/12) or better or pretrauma level acuity. One neglected eye with corneal perforation developed epithelial downgrowth and was enucleated. In Group 3, four out of six patients attained 20/40 (6/12) or better acuity, two phakic and two aphakic, and the remaining two had 20/200 or less (6/60) acuity. In Group 4, three had 20/40 (6/12) or better acuity, two had 20/200 (6/60) or less acuity, and four eyes were enucleated, three for severe endophthalmitis due to *Bacillus cereus* or *Bacillus subtilis* infection and the fourth for severe disorganization. Most surprisingly, six out of seven patients with double perforating injury had final acuity of 20/40 (6/12) or better, and one had only light perception. Two of these patients had early vitrectomy and prophylactic scleral buckling procedure. Two patients had delayed (three weeks or more after the injury) vitrectomy for poorly resolving vitreous hemorrhage but without scleral buckling. The remaining three had repair of perforations with cleaning of the wounds and excision of the prolapsed vitreous. The perforations that involved the sclera alone were also treated this way with the removal of the foreign body from the wound (Color Figure 5) and/or excision of the prolapsed vitreous. In all cases Healon was injected through the entry wound after the removal of the prolapsed vitreous to keep the viterous from getting trapped into the wound during tying of the sutures.

Postoperative complications included retinal detachment in three patients from Group 4, total corneal decompensation in one from Group 4, pupillary block glaucoma in three combined from Group 3 and Group 4, and epithelial downgrowth in one in Group 1. All of these were successfully managed except the one with corneal edema, the one with epithelial downgrowth, and one with retinal detachment.

Of the four perforations due to blunt trauma, three showed surprisingly good visual results despite the fact that injuries were so severe in two that the lens was never found by the surgeon. Interestingly, all of the patients with perforation from blunt trauma were women. The objects that perforated the globe included a broken Coca Cola bottle, an automobile windshield, thorns, splinters of wood, steel pieces from hammering, television cable, electric wiring, flying pieces of coal, and chipped stone. One foreign body of aluminum that could not be found at the time of initial surgery migrated from the posterior to the anterior chamber after nine years (Figure 6). The largest foreign body was a 5x11 mm piece of steel (Figure 7) that made a huge perforation into the globe. it was removed by using the "step by step exploration and repair" technique that is outlined in the section on Materials and Methods. The patient had a long chorioretinal scar, but had a 20/20 (6/6) final visual acuity. Three foreign bodies (one thorn, one splinter of wood, and one steel) in the cornea projecting into the anterior chamber (Figure 8) were successfully removed by the keratotomy incision and needle tip with excellent results. The lenticular foreign body left in the lens led to total opacification of the lens (Figures 9, 10 and 11) and was removed at the time of cataract extraction with final 20/20 (6/6) aphakic vision. Four patients with intracameral foreign bodies (Figure 12) refused to have them removed. The eye in which repair of all structures in one sitting was done was lost.

COMMENTS

The results of this study are in agreement with the current concept that management of anterior segment perforations has greatly improved.[1] Hence, in our series 26 (90%) out of 29 patients with anterior segment perforation without vitreous involvement achieved a final acuity of 20/40 or better (one with 20/50), compared to 20/100 (6/30) or better final acuity in 47% to 58% of the patients forty years ago.[3] This great improvement is due to advent of microsurgery, finer instruments and suture material, antibiotics, better sterility, and earlier patient ophthalmologist contact. Faulty wound healing, improper apposition of wound edges, and infective endophthalmitis are the

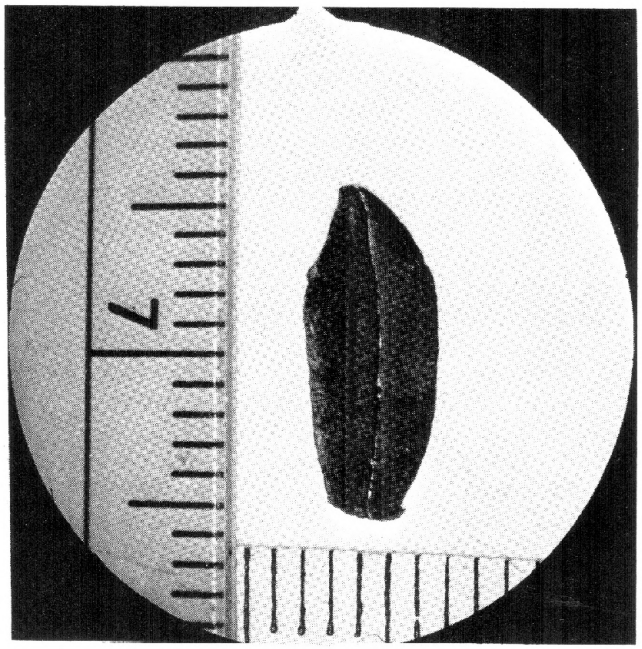

Figure 7. (Awan & Humayun): Foreign body removed from the eye shown in Figure 4. It was removed without complications by authors' step by step dislodgement and suturing of the wound technique. The patient has 20/20 (6/6) visual acuity six years after the injury.

major causes of poor results.[4] In experimental trauma in the rhesus monkey, investigators confirmed that blood in vitreous was often responsible for traction retinal detachment from vitreous traction by stimulating fibrosis.[1] It appears from our study that this may not be as frequent in man as in experimental animals. Out of a total of 16 patients with vitreous injury, seven of which included double-perforation, only four developd retinal detachment. However, it must be mentioned that four of the patients who did not develop retinal detachment after vitreous hemorrhage had undergone vitrectomy, two with and two without prophylactic scleral buckling, after initial wound repair and the extraction of the foreign body. Others have found retinal detachment in 40% of patients if vitreous hemorrhage was present and only in 5% without it.[5]

Vitrectomy through pars plana approach has been employed and found very helpful in the successful management of severe posterior segment perforations.[2, 4-10] From the excellent results in our four patients who had vitrectomy, we are inclined to believe that the use of a well planned vitrectomy at a carefully selected time is a positive development in the management of perforating ocular injuries. The timing of vitrectomy, however, remains controversial.[4,7,9] We are of the opinion that if the patient shows steady improvement, it may be delayed.

It has been stated that lens material mixed with vitreous leads to a poorer prognosis.[4,6] However, in our two patients with particles of cortex in the anterior vitreous no adverse effects from it were seen, and in both the lens material gradually absorbed. Similar observations by others have been made.[7] In another patient the dislodged nucleus in the vitreous was observed by us for two years without inciting inflammation.

Double-penetrating ocular injuries have extremely poor prognosis.[3,4] In our series of seven such injuries only one patient failed to retain any useful sight. We are unable to explain this discrepancy. We are inclined to believe that a carefully planned multi-stage microsurgical approach and vitrectomy are partly responsible for it.

From our experience with this series, we would like to make the following recommendations for the management of perforating injuries:

1. All injuries should be managed by stages, starting with microsurgical repair of the perforation itself. An overly aggressively attempt to repair all injured structures including removal of the lens, vitrectomy, retinal detachment surgery, etc., in a single sitting is not advisable. The surgeon should resist the temptation to be too aggressive in the employment of new procedures. He must guage his intervention by the natural ability of the injured structure to cope with the injury.

2. Central corneal perforations become self-sealed in most instances. However, all perforations near the periphery of the cornea must be carefully sutured and periodically tested for any postoperatively leak (Color Figure 3). In two of our patients with sutured peripheral corneal perforations, leaks were found two weeks after the repair, despite deep anterior chambers and normal acuity.

3. To remove foreign bodies in the corneal perforation that are projecting into the anterior chamber (Figure 8), one should employ a keratotomy

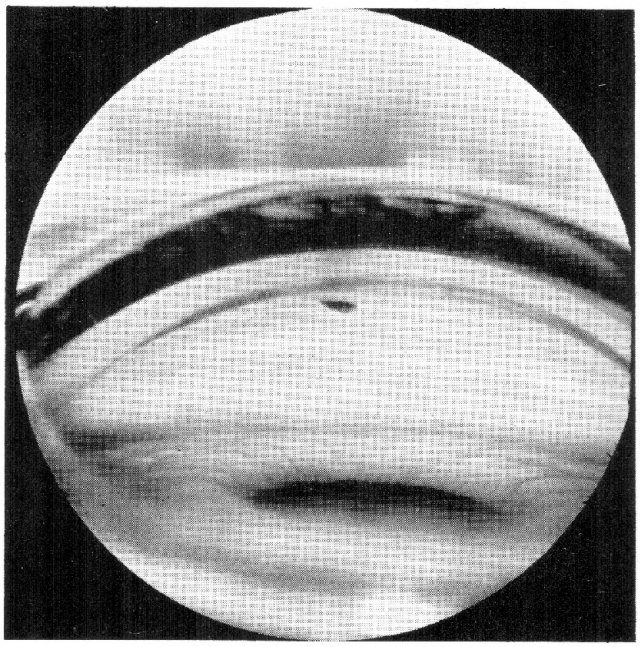

Figure 8. (Awan & Humayun): A foreign body caught in the corneal perforation and projecting into the anterior chamber. It was dislodged with the tip of a fine needle that was passed thru a keratotomy incision made adjacent to the perforation. This approach allows the surgeon to avoid the potentially dangerous entry into the anterior chamber to remove the foreign body.

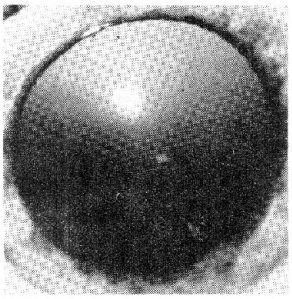

Figure 9

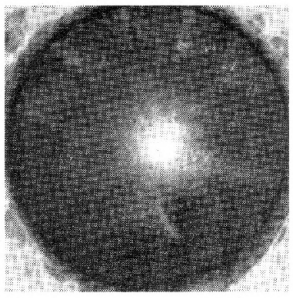

Figure 10

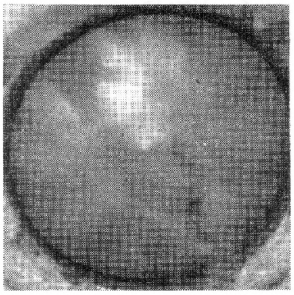

Figure 11

Figures 9, 10, and 11. (Awan and Humayun): Intralenticular foreign body. **Fig. 9.** A week after the injury: **Fig. 10.** A month after the injury; and **Fig. 11.** Three months after the injury. To remove the cataract with the foreign body still in it by cryoextraction failed when the liquified cortex leaked out. The foreign body was fortunately caught by a handy magnet tip before it slipped away into the posterior chamber.

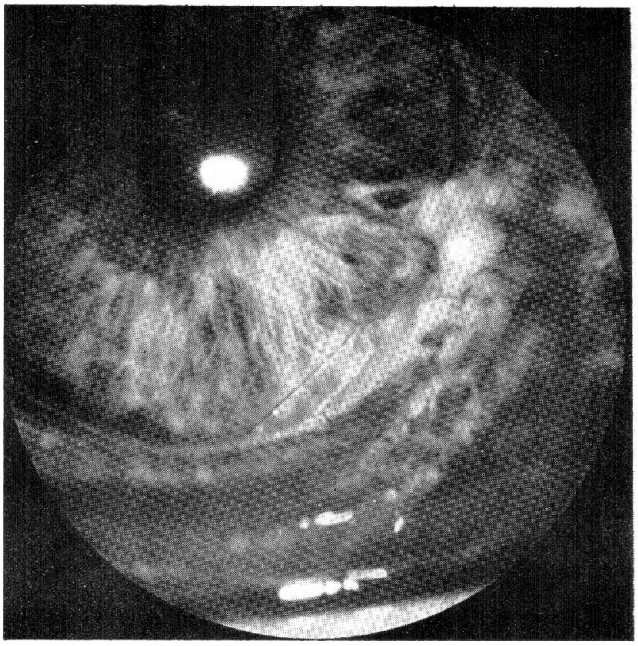

Figure 12 (Awan & Humayun): Intracamaral glass foreign body in a woman's eye. This fragment of automobile windshield got there when the husband shot at the patient while she was in the car. She refused its surgical removal at the time of the initial visit. It was removed six months later because of repeated eye irritation.

incision through which the foreign body is dislodged by the tip of a needle. It is unnecessary and risky to enter the anterior chamber in an attempt to remove such foreign bodies.

4. For larger perforations (Color Figure 4), we found the "step by step" exploration and closure most helpful and beneficial.

5. An early vitrectomy in eyes with a retained intraocular foreign body that is difficult to remove by other methods is a good idea. In other eyes with posterior perforations, vitrectomy and prophylactic scleral buckling may be delayed, if the eye is coming along nicely after the initial repair.

6. It is most important to take immediate cultures and give blanket antibiotic therapy. We have found that any eye that further loses its clarity in a few hours following the initial repair is probably infected. Also the circumstances in which the injury occurred must be considered for possibility of infection. In our patients, injuries that happened in the field or near vegetation had the highest rate of infection. We strongly advise an immediate and thorough vitrectomy if intraocular infection is suspected. We lost three eyes from infective endophthalmitis because of the delay in vitrectomy.

7. Healon or air should be injected into the anterior chamber where entry into the anterior chamber is planned. This is a significant safety measure.

8. A foreign body lying close to the pupil should be brought near the angle before an attempt at its removal is made. This may be accomplished by a magnet or by manipulation through a small incision.

9. It has been suggested that foreign bodies in the lens may be safely removed by intracapsular extraction with a cryo probe sealing the wound of entry in the anterior capsule.[4] We warn that it is not always possible. In fact, it is more likely that the opaque liquified cortex will leak out on manipulation, with resultant loss of the foreign body into the posterior chamber. Moreover, the intracapsular method is not as desirable today as it was in the past. We removed the foreign body from the lens of our patient with a magnet before aspirating the cortex. The result was 20/20 (6/6) postoperative vision. We agree, however, that foreign bodies trapped in the lens must be left alone until the lens becomes cataractous.

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Abstracts From Elsewhere

Edited by Khalid J. Awan, M.D., F.P.A.M.S.

OPHTHALMOLOGY

The Journal of the
American Academy of Ophthalmology

BIOMICROSCOPY AND ARGON LASER PHOTOCYSTOTOMY OF FREE-FLOATING VITREOUS CYSTS. K J Awan. The author describes laser photocystotomy, a new technique that employs a 200 *u* beam of argon laser at a setting of 0.1 second and 500 mW to accomplish cystotomy of symptomatic free-floating vitreous cysts. It was employed successfully in treating this type of cyst in a 23-year-old man. The first photographic documentation of the biomicroscopic features of a free-floating vitreous cyst is included. *Ophthalmology 92:1710-1711, 1985. Reprint requests to Khalid J. Awan, MD, 1921 Park Avenue, SW, Norton VA 24273.*

DIABETIC RETINOPATHY UNDER AGE 20. A REVIEW OF 71 CASES. A S Kimmel, L E Magargal, W H Annesley, Jr, L A Donoso. The authors reviewed the fluorescein angiograms on 4547 diabetic patients with clinically suspected retinopathy. Although only 26 (1%) of the 2013 males and 45 (2%) of the 2534 females were less than 20 years old (71 patients total), proliferative diabetic retinopathy (PDR) was present in 14 females (31%) and 4 males (15%). The youngest patient, a 13-year-old boy with diabetes for eight years, presented with severe proliferative diabetic retinopathy in both eyes, but no evidence of other systemic complications of diabetes. the authors emphasize the importance of having prepubescent and teenage diabetics examined for the presence of retinopathy. *Ophthalmology 92:1047-1050, 1985. Reprint requests to larry E. Magargal, MD, Retina Vascular Unit, Wills Eye Hospital, 9th and Walnut Streets, Philadelphia, PA 19107.*

THE INCIDENCE OF RETINAL DETACHMENT FOLLOWING EXTRACAPSULAR CATARACT EXTRACTION. A TEN-YEAR STUDY. P Coonan, W E Fung, R G Webster, Jr, A W Allen, Jr, R L Abbott. The authors studied 842 consecutive patients for incidence of specific complications following extracapsular cataract extraction. The minimum follow-up time was one year and mean 32.2 months. The incidence of retinal detachment in the entire population was 1.4%. In those eyes with a cataract as the only ocular abnormality and with no surgical complications, the frequency was 1.0%. The incidence in eyes following uncomplicated procedures, with no other ocular pathology and with an intact posterior capsule was 0.8%. The incidence of opacification of the posterior capsule requiring capsulotomy was 16.7%. The mean time interval for a secondary capsulotomy was 24.3 months. The authors found a positive correlation between the time interval and patient age. *Ophthalmology 92:1096-1101, 1985. Reprint requests to Wayne E. Fung, MD, 2351 Clay Street, Suite 414, San Francisco, CA 94115.*

VITRECTOMY FOR CHRONIC APHAKIC CYSTOID MACULAR EDEMA. RESULTS OF A NATIONAL, COLLABORATIVE, PROSPECTIVE, RANDOMIZED INVESTIGATION. W E Fung, Vitrectomy - ACME Study Group. Twenty-seven experienced vitrectomy surgeons in 15 medical centers did a five-year (1979-1984) prospective, randomized, controlled, collaborative study on 136 surgically aphakic eyes without lens implants but with vitreous adherent to the corneoscleral wound and with chronic aphakic cystoid macular edema (ACME). The entire course of investigation was completed on 115 eyes. The purpose of the study was to determine the effectiveness of vitrectomy in eliminating established ACME and to determine the natural history of this condition. Following criteria contained within the study protocol, 68 eyes were randomized to surgery (RAN-S) or control (RAN-C), and 47 eyes were observed in the long-term observation group (LTO). Twenty-one eyes were eliminated from the investigation for reasons stated in the text. The RAN-S group proved to have a significantly better visual course than the RAN-C group (P = less than 0.01). An analysis of the LTO group revealed that if central vision did not decline to a level of 20/80 or worse, 27% of the eyes had a chance of spontaneously improving to a level of 20/50 or better. However, if central vision declines to or beyond this point, spontaneous visual improvement to 20/50 or better only occurred in 8% of eyes. The role of systemic diseases in ACME, the incidence of vitreous traction on the macula, prognostic value of pre-surgical medical therapy, a comparison of limbal versus pars plana surgical approach, the timing of surgery, and the effectiveness of fluorescein angiography as an objective monitor of visual function are also reported. *Ophthalmology 92:1102-1111, 1985. Reprint requests to Wayne E. Fung, MD, 2351 Clay Street, Suite 414, San Francisco, CA 94115.*

RADIATION OPTIC NEUROPATHY. L B Kline, J Y Kim, R Ceballos. Radiation therapy is an accepted treatment in reducing tumor recurrence following surgery for pituitary adenoma. A potential complication of this radiation therapy is delayed radionecrosis of perisellar neural structures, including the optic nerves and chiasm. Radiation optic neuropathy (RON) as a cause of visual loss has not been emphasized in the ophthalmologic literature. The authors report four cases of radiation optic neuropathy diagnosed by: (1) acute visual loss

(monocular or binocular), (2) visual field defects indicating optic nerve or chiasmal dysfunction, (3) absence of optic disc edema, (4) onset usually within three years of therapy (peak: 1-1½ years), and (5) no computed tomographic evidence of visual pathway compression. Pathologic findings, differential diagnosis and therapy of RON are discussed. *Ophthalmology 92:1118-1126, 1985. Reprint requests to Lanning B. Kline, MD, Suite 555, 1600 7th Avenue South, Birmingham, AL 35233.*

CHLOROQUINE RETINOPAHTY. IS FLUORESCEIN ANGIOGRAPHY NECESSARY? A F Cruess, A P Schachat, J Nicholl, J J Augsburger. The authors reviewed color fundus photographs and corresponding fluorescein angiograms from 83 patients suspected of having chloroquine retinopathy to determine the relative sensitivity of these two photographic methods in the diagnosis of retinal toxicity. They identified retinal toxicity on both color photographs and fluorescein angiograms in 7.6% of cases, on the color photographs but not on the corresponding angiograms in 6.1% of cases, and on the fluorescein angiograms but not on the color photographs in 1.5% of cases. In the opinion of these authors fluorescein angiography may not be as sensitive as color fundus photography or ophthalmoscopy in the diagnosis of chloroquine retinopathy. *Ophthalmology 92:1127-1129, 1985. Reprint requests to Alan F. Cruess, MD, Department of Ophthalmology, Queen's University of Kingston, Ontario, Canada, K7L 3N6. (613-549-2474).*

MEDICAL MANAGEMENT OF CONGENITAL NASOLACRIMAL DUCT OBSTRUCTION. L B Nelson, J H Calhoun, H Menduke. The authors treated 113 consecutive children with congenital nasolacrimal duct obstruction with local massage and topical antibiotic ointment. The obstruction was resolved in 107 patients within eight months of initiation of this form of management. Nearly all of the children were spared a surgical procedure that probably would have been performed if early probing of the nasolacrimal system had been advocated. The technique consisted of placing the index finger over the common canaliculus to block the exit of material through the puncta and stroking downward firmly to increase hydrostatic pressure within the nasolacrimal sac. The parents were instructed to perform this maneuver for about 5 strokes twice a day. Erythromycin ophthalmic ointment was prescribed to be used twice a day when a mucopurulent discharge was present. *Ophthalmology 92:1187-1190, 1985. Reprint requests to Leonard B. Nelson, MD, Wills Eye Hospital, Department of Pediatric Ophthalmology, 9th and Walnut Streets, Philadelphia, PA 19107.*

RELAXING INCISIONS. CORNEAL TOPOGRAPHY. M K Lundergan, J Rowsey. Using the corneoscope, authors studied the topography of circumferential corneal relaxing incisions in eye bank eyes. Significant flattening in the meridian perpendicular to the corneal relaxing incision was found with steepening 90° away in a ratio of two diopters of flattening to one diopter of steepening. This study demonstrates the range of change in corneal astigmatism from 0.58 D for a single one clock hour incision to 5.93 D for a unilateral three clock hour incision. This is compared to symmetrical relaxing incisions placed 180° apart which produce 0.78 D of astigmatic change for one clock hour incisions, and 13.97 D of change for symmetrical three clock hour incisions. The larger shifts in corneal power were also associated with a small degree of central corneal flattening or decreased corneal power. *Ophthalmology 92:1226-1236, 1985. Reprint requests to J. James Rowey, MD, Dean A. McGee Eye Institute, 608 Stanton L. Young, Oklahoma City, OK 73104.*

FACTORS AFFECTING PREDICTABILITY OF RADIAL KERATOTOMY. D R Sanders, M R Deitz, D Gallagher. One big objection of radial keratotomy (RK) has been its lack of predictability. This has been due in large measure to the use of simple correlational statistics assessing the relationship between refractive result and each predictor-variable being evaluated separately. The authors utilize multivariate analysis in an attempt to account for the effects of a number of predictor-variables simultaneously. Variables studied included patient age, optical zone size, number of incisions, mean incision depth, preoperative average keratometry, preoperative average applanation tension, patient sex, and age-sex interrelationship. The area of the optical clear zone selected by the surgeon was found to be the most important factor determining refractive change as a result of RK, explaining one-quarter to one-half of the variability of the procedure. The authors discuss the effects of the other factors and the limitations of the method. Although this method cannot produce a fully predictive equation, the authors believe this analysis can serve as a good starting point for beginning RK surgeons and a method by which experienced RK surgeons can improve their techniques. *Ophthalmology 92:1237-1243, 1985. Reprint requests to Donald R. Sanders, MD, Ph.D, 1855 W. Taylor St., Chicago, IL 60612.*

RADIAL KERATOTOMY COMPLICATED BY STERILE KERATITIS AND CORNEAL PERFORATION. HISTOPATHOLOGIC CASE REPORT AND REVIEW OF COMPLICATIONS. D J Karr, R D Grutzmacher, M J Reeh. A 35-year-old physician underwent radial keratotomy for correction of myopia. The surgeon used combined radial and transecting circumferential incisions which resulted in wound gape, persistent epithelial defect, and severe sterile keratitis. Progressive corneal decompensation required an initial patch graft followed by a penetrating keratoplasty four months after RK.

Histopathology of the cornea demonstrated epithelial edema and persistent incisional epithelial plug formation, deep and superficial vascularization, variable incision depth, endothelial cell loss, and inflammatory cell infiltration at all levels of the cornea. The authors review the reported complications of radial keratotomy. *Ophthalmology 92:1244-1248, 1985. Reprint requests to Richard D. Grutzmacher, MD, Department of Ophthalmology, RJ-10, University of Washington, Seattle, WA 98194.*

CHOICE OF PROCEDURE. ENUCLEATION, EVISCERATION, OR PROSTHETIC FITTING OVER GLOBES. R K Dortzbach, J L Woog. In the opinion of the authors, enucleation is more likely to be associated with certain intraoperative and postoperative complications but remains the procedure of choice in cases where detailed histopathologic examination of the globe is required, in many cases of intraocular neoplasm, and in selected cases of ocular trauma with visual loss. Evisceration results, in many patients, in enhanced cosmesis compared to enucleation and is a technically simpler and faster operation, and may be indicated in patients with blind and unsightly or painful eyes and in selected instances of ocular trauma following discussion of the risk of sympathetic ophthalmia with the patient. It is contraindicated in patients with possible intraocular malignancy. A cosmetic shell or contact lens may constitute an alternative to enucleation or evisceration, and may provide superior cosmesis in selected patients. Management of patients requiring these procedures should be tailored to the particular clinical situation with consideration of the wishes of the well-informed patient. *Ophthalmology 92:1249-1255, 1985. Reprint requests to Richard K. Dortzbach, MD, Clinical Science Center, Department of Ophthalmology, 600 Highland Avenue, Madison, WI 53792.*

ACQUIRED MACULAR DEGENERATION. I. NONEXUDATIVE (DRY) MACULAR DEGENERATION. K G Noble, R E Carr. A clinicaldistinction has been made between an exudative (wet) and a nonexudative (dry) macular degeneration based on the presence or absence of fluid. Fluorescein angiography of dry macular degeneration is quite nonspecific and varies according to the fundus changes. While nonexudative (dry) degeneration accounts for 90% of all cases of acquired macular degeneration, it results in visual loss to the level of legal blindness in only some 10%. This is in marked contrast to the severe visual loss suffered by patients with the most serious form of exudative maculopathy, disciform macular degeneration.

MUCUS FISHING SYNDROME. J P McCulley, M B Moore, A Y Matoba. The authors describe 25 patients with a variety of external ocular diseases including keratoconjunctivitis sicca, blepharitis, and allergic conjunctivitis, who presented with persistence of symptoms of irritation, foreign body sensation, and apparent excessive mucus production, with mild conjunctival inflammation despite appropriate treatment of the underlying disease. All patients were found to have evidence of trauma to the conjunctival epithelium due to mechanical removal of the excess mucus from the surface of the globe or inferior cul-de-sac. The surface irritation created by the mechanical damage led to a further increase in mucus production, creating a cycle that the authors have termed mucus fishing syndrome. The discontinuation of this behavior coupled with ongoing therapy of the underlying disease led to resolution of signs and symptoms in all patients. *Ophthalmology 92:1262-1265, 1985. Reprint requests to James P. McCulley, MD, 5323 Harry Hines Blvd, Dallas, TX 75235.*

LEVOBUNOLOL. A BETA-ADRENOCEPTOR ANTAGONIST EFFECTIVE IN THE LONG-TERM TREATMENT OF GLAUCOMA. The Levobunolol Study Group. The authors compared the ocular-hypotensive efficacy and systemic and ocular safety of an ophthalmic solution of levobunolol (0.5% and 1%) twice daily, with timolol (0.5%) twice daily in a long-term, double-masked study of 391 patients with open-angle glaucoma or ocular hypertension. The patients included in the study received the test medication in both eyes for up to two years. Over the two-year period, both concentrations of levobunolol reduced mean IOP by 27% (range, -6 to -8 mmHg). This ocular hypotensive effect was sustained throughout the study and was similar to that produced by timolol. Slight decreases in mean heart rate and blood pressure were observed. No unexpected adverse ocular or systemic reactions were reported. The authors concluded that levobunolol is an effective therapy for the long-term treatment of glaucoma. *Ophthalmology 92:1271-1276, 1985. Reprint requests to Gary Novack, PhD, Allergan Pharmaceuticals, Inc., 2525 Dupont Drive, Irvine, CA 92715.*

ANTIBODIES TO ORAL MUCOSA IN PATIENTS WITH OCULAR BEHCET'S DISEASE. J B Michelson, F V Chisari, T Kansu. The authors report a method for the identification of cytoplasmic antibodies in patients with Behcet's disease and uveitis. They found the assay to be positive in at least 80% of patients in an American population with definite or probable Behcet's disease and 60% of patients from a Turkish population with definite Behcet's disease, with a false-positive rate of 6.5% among non-Behcet's ocular inflammatory disorders with vasculitis. When refined, this test may prove useful to the ophthalmologist in selecting out those patients with Behcet's disease from the larger group of patients with uveitis for whom no systemic etiology is identified. *Ophthalmology 92:1277-1281, 1985. Reprint requests to Joseph B. Michelson, MD, Division of Ophthalmology, Scripps Clinic and Research Foundation, 10666 North Torrey Pines Road, La Jolla, CA 92037.*

PATHOLOGY OF CORNEAL HYDROGEL ALLOPLASTIC IMPLANTS. R L Peiffer, T P Werblin, A W Fryczkowski. Hydrogel keratophakia is a new form of lamellar refractive surgery which, in theory, can deal with almost all forms of refractive error. The authors examined the histopathological effects of several types of hydrogel materials on the cornea of non-human primates. With the exception of one type of hydrogel material, which was associated with endothelial cell degeneration, only minor histopathologic changes were seen up to a maximum of one year of observation, including thinning of the epithelium and decreased population of stromal keratocytes. These changes did not correlate with any clinical abnormalities. Additional extensive preclinical testing and eventual human clinical trials will determine the safety and efficacy of this procedure. *Ophthalmology 92:1294-1304, 1985. Reprint requests to Robert L. Peiffer, MD, Department of Ophthalmology, School of Medicine, 617 Clinical Sciences Bldg. 229H, University of North Carolina, Chapel Hill, NC 27514.*

MAGNETIC RESONANCE SCANNING IN ORBITAL TUMOR DIAGNOSIS. D H Char, D Sobel, W H Kelly, B O Kjos, D Norman. The authors compared the accuracy of magnetic resonance scanning (MRI) versus computed tomography (CT) in the differentiation of lateral orbital masses. They concluded that the MRI results did not improve our ability to accurately diagnose malignant epithelial and lymphoid tumors. *Ophthalmology 92:1305-1310, 1985. Reprint requests to Devron H. Char, MD, S-315, University of California, San Francisco, CA 94143.*

MANAGEMENT OF COMPLICATIONS FOLLOWING DERMIS-FAT GRAFTING FOR ANOPHTHALMIC SOCKET RECONSTRUCTION. J W Shore, C D McCord, Jr, J Bergin, S J Dittmar, J P Maiorca, W R Burks. The authors reviewed 60 consecutive cases of dermis-fat grafts for anophthalmic socket reconstruction to examine the frequency, severity, and management of postoperative complications. The conjunctiva failed to resurface the graft and central ulceration developed in seven patients, enophthalmos in 10, keratinized sockets wih chronic discharge and desquamation in two, conjunctival granulomas in three, and a primary graft infection in one. A donor site hematoma occurred in one patient. Secondary surgical intervention was required in ten patients. Nine complications in eight patients were managed in the office; five complications in four patients were observed and subsequently resolved without surgical intervention. *Ophthalmology 92:1342-1350, 1985. Reprint requests to John W. Shore, MD Lt. Col., Department of Ophthalmology/SGHSE, Wilford Hall USAF Medical Center, Lackland AFB, TX 74236-5300.*

KRYPTON RED LASER PHOTOCOAGULATION FOR SUBRETINAL NEOVASCULARIZATION. J L Shakin, L A Yannuzzi, E P Shakin, Y L Fisher. The authors treated 157 patients with subretinal neovascularization (SRN) in a prospective, nonrandomized, consecutive study with the krypton red laser (KRL). The patients were analyzed on the basis of age, etiology of the SRN, location of the SRN, and pre- and post-treatment visual acuity in patients with at least three months follow-up. Previous studies have not investigated KRL photocoagulation within the foveal avascular zone (FAZ). The results of this study compare favorably with other large series in which patients with SRN located outside the FAZ were treated wih the argon blue-green laser (ABGL). *Ophthalmology 92:1364-1370, 1985. Reprint requests to Jeffrey L. Shakin, MD, 535 Park Avenue, New York, NY 10021.*

MEASUREMENTS OF REVERSIBILITY OF OPTIC DISC CUPPING AND PALLOR IN OCULAR HYPERTENSION AND GLAUCOMA. B Schwartz, T Takamoto, P Nagin. The authors present four cases of young and elderly glaucoma patients who had both surgical and medical therapy and showed reversal of cupping and pallor of the optic disc. The cupping was measured by photogrammetry and the pallor by computerized image analysis from photographs of the optic disc. Two patients showed regression of visual field loss. The decrease in ocular pressure was accompanied by regression of visual field loss and a decrease in cupping; pallor did not decrease consistently. The changes in cupping and pallor in some patients followed similar courses but in others behaved in an independent manner. The authors propose that these new sensitive and reproducible techniques for measuring changes in the optic disc may allow the detection of disc changes early in the disease, prior to visual field loss. If treatment is begun at this time, reversal of optic disc changes may occur. *Ophthalmology 92:1396-1407, 1985. Reprint requests to Bernard Schwartz, MD, PhD, Department of Ophthalmology, Tufts-New England Medical Center, 171 Harrison Avenue, Boston, MA 02111.*

CONJUNCTIVAL AUTOGRAFT TRANSPLANTATION FOR ADVANCED AND RECURRENT PTERYGIUM. K R Kenyon, M D Wagoner, M E Hettinger. The authors describe the technique and results of conjunctival autograft transplantation for advanced and recurrent pterygium in 57 eyes of 54 patients. The pterygia were recurrent in 41 eyes, with diplopia in 14 patients due to cicatrical involvement of the medial rectus muscle in all cases, free conjunctival grafts from the superotemporal bulbar conjunctiva of the same eye were used to resurface exposed sclera and extraocular muscle. There were no intraoperative complications. Postoperative follow-up ranges from 1 to 67 months, with a mean of 24 months. Only three pterygia have recurred (5.3%); two were successfully remedied by a second conjunctival autograft, whereas the third did not require an additional procedure. In all 14 patients

with diplopia, extraocular movement was restored. The surgical procedure includes: (1) After a rigid lid speculum is placed in position, a forced duction testing is performed to demonstrate mechanical limitation of extraocular movement; (2) The eye is abducted maximally for a nasal pterygium and multiple cautery spots are used to delineate the involved area of conjunctiva to be excised; (3) Beginning at the head of the pterygium, involved cornea is superficially excised to the limbus. Scissors are used for complete circumcision of the conjunctiva at the cautery marks; (4) The conjunctiva and Tenon's capsule are freed from the horizontal rectus muscle, and a complete resection is done of involved conjunctiva, Tenon's caspule and cicatrix; the bare sclera and rectus muscle remain exposed; (5) The adjacent limbus and cornea are polished with a diamond burr; (6) Conjunctival margins are recessed to restore fornix, and conjunctiva is sutured to sclera with absorbable suture on spatula needle; (7) The globe is rotated inferomedially to access uninvolved superior bulbar conjunctiva and free grafts as large as 15 x 15 mm and extending to the limbus can be prepared and used without difficulty; (8) The graft is dissected as thinly as possible in the same manner as a thin conjunctival flap. The donor site requires no suturing and will heal rapidly without scarring; (9) The eye is adbucted and the free graft transferred into the recipient bed with interrupted sutures; (10) Postoperatively, topical steroid and antibiotic ointments are administered frequently. The authors recommend this surgical approach as a safe and effective means of treating pterygia complicated by conjunctival scarring with extraocular muscle involvement and requiring concurrent fornix reconstruction. *Ophthalmology 92:1461-1470, 1985. Reprint requests to Kenneth R. Kenyon, MD, Cornea Service, Massachusetts Eye & Ear Infirmary, 243 Charles Street, Boston, MA 02114.*

THE DIAGNOSTIC VALUE OF A RING INFILTRATE IN ACANTHAMOEBIC KERATITIS. F H Theodore, F A Jakobiec, K B Juechter, P Ma, R C Troutman, P M Pang, T Iwamoto. Acanthamoebae can directly infect the cornea, usually after trauma, associated with contaminated water or soft contact lens wear. Usually the correct diagnosis is made only after pathologic examination of resected corneal specimens or enucleated eyes. The authors report three cases, two of which were accurately diagnosed by corneal scrape-smears and cultures before penetrating keratoplasty was performed. The reason for the accurate laboratory diagnosis in these cases was the presence of a diagnostic paracentral annular corneal infiltrate or abscess, a feature identified in over two-thirds of the earlier cases but one which has not been adequately emphasized or pursued for its early diagnostic value. The authors review the other clinical and epidemiological features of this entity, microbiological diagnostic techniques, the pathologic aspects, the role of topically and systemically administered medicaments, and finally point out the almost unavoidable role of penetrating keratoplasty after the temporizing effects of medical treatments have been achieved. *Ophthalmology 92:1471-1479, 1985. Reprint requests to Frederick H. Theodore, MD, 625 Park Avenue, New York, NY 10021.*

EXTRACAPSULAR CATARACT EXTRACTION AND POSTERIOR CHAMBER INTRAOCULAR LENS IMPLANTATION IN GLAUCOMATOUS EYES. J A Savage, J V Thomas, C D Belcher, III, R J Simmons. The authors sudied 296 eyes of 250 patients undergoing extracapsular cataract extraction (ECCE) with or without the implantation of a posterior chamber intraocular lens (PC-IOL). Pre-existing glaucoma of varying severity was present in 139 eyes and no known ocular pathology other than cataract in 157 eyes. During the first eight weeks following surgery, intraocular pressure elevations $\geq$15 mmHg above baseline were seen in 23% of glaucomatous eyes controlled before surgery with glaucoma medications, in 39% of glaucomatous eyes controlled before surgery with argon laser trabeculoplasty, and in only 3% of nonglaucomatous eyes. The implantation of a PC-IOL did not influence the incidence of postoperative intraocular pressure (IOP) elevations. Among glaucomatous eyes with severe preoperative visual field loss (split fixation or central island $\leq$ 10 degrees), 9.7% had worsening of visual field after surgery. Open angle glaucoma of unclear etiology developed in 1.4% of normal eyes following uncomplicated ECCE with PC-IOL implantation. They discuss the surgical techniques they have found useful in glaucomatous eyes undergoing ECCE with PC-IOL implantation. *Ophthalmology 92:1506-1516, 1985. Reprint requests to L. Terry, Librarian, New England Glaucoma Research Foundation, Inc., 100 Charles River Plaza, Boston, MA 02114.*

THE EFFICACY OF ADDITIONAL ARGON LASER PHOTOCOAGULATION FOR PERSISTENT, SEVERE PROLIFERATIVE DIABETIC RETINOPATHY. A K Vine. Twenty-three eyes with severe proliferative diabetic retinopathy had failed to show a satisfactory response to initial panretinal photocoagulation of approximately 3000 burns. A satisfactory response was defined as two or less retinopathy risk factors as defined by the diabetic retinopathy study (DRS). These eyes were treated with additional, extensive ablative laser therapy. Twelve of the 23 eyes showed a satisfactory response after an average of 7550 burns. Eleven eyes failed to show a satisfactory response after an average of 7985 burns. Forty-five percent of eyes that failed to show a satisfactory response suffered a severe decrease in visual acuity to count fingers or less. Additional extensive laser therapy can induce a satisfactory response in approximately 50% of resistant nonresponder eyes. Failure to respond to such therapy indicates a poor prognosis. *Ophthalmology 92:1532-1537, 1985. Reprint requests to Andrew K. Vine, MD, Vitreo-Retina Service, W.K.*

Kellogg Eye Center, 1000 Wall Street, Ann Arbor, MI 48105.

NECROTIZING SCLERITIS. A CLINICO-PATHOLOGIC STUDY OF 41 CASES. N A Rao, G E Marak, A A Hidayat. Scleritis is not a single clinical or pathologic entity, but has several distinct forms, which may reflect different mechanisms of immunopathogenesis. Three main groups may be identified: (1) scleral inflammations associated with various systemic autoimmune diseases, including 11 cases of rheumatoid arthritis, three cases of Wegener's granulomatosis, one case of polychondritis, and one case of Goodpasture's syndrome; (2) infectious scleritis, consisting of four cases of herpes zoster ophthalmicus and two cases of pseudomonas scleritis; and (3) idiopathic scleritis, without evidence of systematic disorder, consisting of 19 cases. The first group exhibited predominantly necrosis of the sclera surrounded by granulomatous inflammation and vasculitis. None of these cases showed lymphoid follicles, or healing atempts manifested by proliferation of fibroblasts and blood vessels at the site of inflammation. The idiopathic group revealed few small foci of scleral necrosis and mainly non-granulomatous inflammation. In addition, there was evidence of proliferation of granulation tissue and lymphoid follicles in this group of eyes. *Ophthalmology 92:1542-1549, 1985. Reprint request to N.A. Rao, MD, Estelle Doheny Eye Foundation, 1355 San Pablo Street, Los Angeles, 90033.*

ECCENTRIC VISUAL ACUITY IN PATIENTS WITH MACULAR DISEASE. M J Harris, D Robins, J M Dieter, Jr., S L Fine, D L Guyton. A series of cards each containing a two dimensional array of identical Snellen "E's" was used to determine best eccentric visual acuity in patients with macular disease having Snellen visual acuity of 20/70 or worse. Each "full field E" card simultaneously presents the same letter to foveal and parafoveal areas. This test can therefore determine quickly if potenitally useful vision is present in any area of the central visual field. In our study of 37 eyes, 70% demonstrated potential visual acuity at least two times better than visual acuity measured by conventional methods, and 20% demonstrated at least a fourfold improvement. This suggests that most patients with macular disease do not spontaneously employ their best remaining area of retina for fixation. *Ophthalmology 92:1550-1553, 1985. Reprint requests to David L. Guyton, MD, Wilmer B1-35, Johns Hopkins Hospital, Baltimore MD 21205.*

INTRAOCULAR INJECTION OF LIDOCAINE. H Lincoff, P Zweifach, S Brodie, W Fuchs, S Gross, E Kornmehl, M Krauss, T Iwamoto, F Jakobiec. The authors report three patients in whom lidocaine was inadvertently injected intraocularly. One patient who had not received prior mydriatics developed immediate dilation and paralysis of the pupil and diminished visual acuity to counting fingers. Retinal function began to improve after four hours and both retinal and pupillary function recovered completely by 16 hours. The second patient also recovered completely. The third patient developed a permanent field defect. The authors studied the effects of intraocular lidocaine in an animal model. Lidocaine temporarily paralyzed the pupil in mydriasis and temporarily extinguished the b-wave of the electroretinogram. Light and electron microscopy study of the retina revealed no damage beyond that at the perforation site. *Ophthalmology 92:1587-1591, 1985. Reprint requests to Harvey Lincoff, MD, the New York Hospital, 525 East 68th Street, New York, NY 10021.*

LONG-TERM SURVIVAL OF CRYOPRESERVED CORNEAL ENDOTHELIUM. R O Schultz, M Matsuda, R W Yee, D B Glasser, S M Sabin, H F Edelhauser. The authors evaluated by regional specular microscopy and computer-assisted morphometric analysis the corneas of five patients who received cryopreserved penetrating grafts 15 years previously were evaluated. This technique quantitates changes in celll size and shape as well as cell number. The authors made comparison with five eyes in four patients 15 years after penetrating keratoplasty utilizing fresh grafts. In three patients, fresh and frozen tissue were transplanted in the same host. These examintions showed no difference in structure or function comparing cryopreserved tissue with fresh donor tissue. *Ophthalmology 92:1663-1667, 1985. Reprint requests to Richard O. Schultz, MD, Department of Ophthalmology, The Medical College of Wisconsin, 8700 West Wisconsin Avenue, Milwaukee, WI 53226.*

CLINICAL APPLICATIONS OF THE ORGANIC DYE LASE. F A L'Esperance, Jr. The author states that clinical research utilizing the yellow, orange and red wavelengths of the dye laser (Rhodamine 6G and MD-631) indicates that the liquid organic dye laser may have considerable applications in ocular photodynamic and photocoagulation therapy. The effectiveness of the dye laser as a photodynamic (photoradiation) and photocoagulation source is due to the large numbers of wavelengths of relatively high output power that can be produced in the visible spectrum. Therefore, a target tissue can be selectively destroyed with minimal laser energy necessarily transmiitted through the refractive media. The dye laser, as a photoradiation or photocoagulation system, should prove valuable in the therapy of ocular disease. *Ophthalmology 92:1592-1600, 1985. Reprint requests to Francis A. L'Esperance, MD, 1 East 71st Steet, New York, NY 10021.*

REFRACTIVE KERATOPLASTY. HISTOPATHOLOGY OF CLINICAL SPECIMENS. S D Baumgartner, P S Binder. The authors evaluated two keratophakia (KF), one epikeratophakia (EKP), three myopic keratomileusis (MKM), and three

hypermetropic keratomileusis (HKM) specimens obtained 3½ to 31 months following refractive keratoplasty. The corneas were removed at keratoplasty due to postoperative complications, such as corneal edema, irregular astigmatism, delayed reepithelialization, stromal ulceration, epithelial interface ingrowth, and loss of visual acuity. The KF specimens demonstrated viable epithelium in the recipient-donor lenticule interface, disruption of the normal collagen lamellar pattern in the lenticule, and absence of keratocytes. All of the keratomileusis lenticules and the one epikeratophakia lenticule had variable keratocyte repopulation. All specimens showed irregular epithelial maturation. In one case of myopic keratomileusis, ferritin-like particles were found in the epithelial intercellular spaces. Folds in Bowman's membrane were seen in several keratomileusis lenticules; in one case, breaks in Bowman's membrane (BM) were seen. *Ophthalmology 92:1606-1615, 1985. Reprint requests to Perry S. Binder, MD, 9834 Genesee Avenue, Suite 200, La Jolla, CA 92037.*

THRESHOLD FOR LENS DAMAGE DURING Q-SWITCHED ND: YAG LASER IRIDECTOMY. A STUDY OF RHESUS MONKEY EYES. D E Gaasterland, M M Rodrigues, G Thomas. The authors performed clinical and pathologic examinations after 18 iridectomies had been created in six eyes of three rhesus monkeys using increasing Q-switched neodymium (Nd):YAG laser energy, pulses per burst, and number of bursts. The threshold for lens damage during iridectomy was studied. Iridectomy with one or two bursts of one or two Q-switched pulses at 5 to 6.2 mJ per pulse was achieved without lens damage. Slight increase of pulse energy or an increase to three pulses per burst (without pulse energy increase) caused local damage to the underlying lens. Marked increase of any of the treatment parameters caused slightly larger iridectomies and slightly larger, localized damage of the underlying lens. Synechiae developed between the monkey posterior iris surface at the iridectomy and the damaged area in 80% of the lens lesions. In monkeys, the small pulsed laser iridectomies created with pulses of energies up to 6.5 mJ became occluded during the healing process. *Ophthalmology 92:1616-1623, 1985. Reprint requests to D E Gaasterland, MD, Center for Sight, Georgetown University, 5 Kobler Cogan, 3800 Reservoir Road, N.W., Washington, DC 20007.*

TUBERCULOSIS OF THE ORBIT. M Khalil, S Lindley, E Matouk. The authors report two cases of orbital tuberculosis in white Canadians who did not suffer from pulmonary tuberculosis. The orbital disease was associated with tuberculous sinusitis in the first case and blood-borne from constrictive tuberculous pericarditis in the second case. Since acid-fast bacilli are difficult to detect in the pathological specimens, the diagnosis is usually based on the following: (1) the positive tuberculin skin test; (2) the caseating granulomatous inflammatory lesion on histopathology, which is highly suggestive of active tuberculosis; (3) the positve culture for Mycobacterium tuberculosis if the specimens are obtained early in the course of the disease; and (4) the complete resolution of the disease with the specific antituberculous medications. *Ophthalmology 92:1624-1627, 1985. Reprint requests to M. Khalil, MD, Department of Ophthalmology, 4th floor Livingston hall, The Montreal General Hospital, 1650 Cedar Avenue, Montreal, Quebec, H3G 1A4.*

INTRAOCULAR LENSES: A HISTOPATHOLOGIC STUDY OF EYES, OCULAR TISSUES, AND INTRAOCULAR LENSES OBTAINED SURGICALLY. R Champion, W Green. The authors studied the histopathologic features of complications related to anterior chamber, iris-fixation, iridocapsular, and posterior chamber lens implantation. The major histopathologic findings in the corneal buttons were endothelial attenuation or absence, variable retrocorneal fibrous tissue proliferation, and corneal edema. We observed fibrocytes, collagen, macrophages, multinucleated giant cells, iris melanocytes, iris pigment epithelial, endothelial-like cells, lens epithelial cells, inflammatory cells, erythrocytes, and free pigment granules mostly from the iris pigment-epithelium on these IOLs. Granulomatous reaction to the IOL was observed in 50% of removed IOLs. Vitreous, accounting for 53 of the specimens, was obtained for diagnostic or therapeutic reasons that included: endophthalmitis in 17 (32.1%) cases; retinal detachment in 13 (24.5%); vitreous hemorrhage in five (9.4%); pupillary membrane, subluxation or dislocation of IOL, and epithelial ingrowth in four (7.5%) cases each; granulomatous or nongranulomatous vitritis in two (3.8%) cases; and opacification of posterior capsule in four (7.5%) cases. The principal reasons for enucleation in 14 eyes were: the sequelae of bacterial endophthalmitis in four (28.6%); malignancies in two (14.4%); neovascular and blood-induced glaucoma in two (14.4%); traumatic rupture of globe in one (7.1%); acute peripheral corneal melting with massive choroidal hemorrhage in one (7.1%); dislocation of anterior chamber IOL into the supraciliary space and secondary glaucoma in one (7.1%); secondary glaucoma with extensive peripheral anterior synechia in one (7.1%); chronic uveitis with secondary glaucoma in one (7.1%); and chronic bullous keratopathy with secondary glaucoma in one (7.1%). The causes for reoperation on eyes with prior IOL surgery included: pseudophakic bullous keratopathy (98 cases), dislocation or subluxation of IOL (33 cases), secondary glaucoma (28 cases), retinal detachment (23 cases), and postoperative infectious endophthalmitis (20 cases). *Ophthalmology 92:1628-1645, 1985. Reprint requests to W. Richard Green, MD, Eye Pathology Laboratory, Johns Hopkins Hospital, 600 N. Wolfe Street, Baltimore, MD 21205.*

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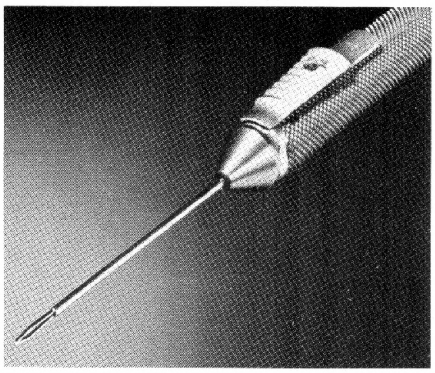

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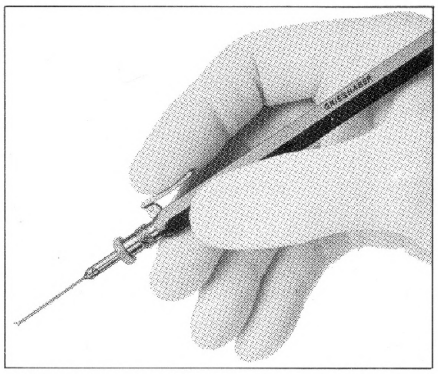

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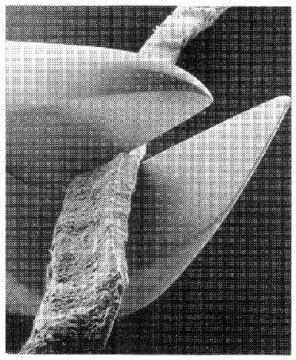

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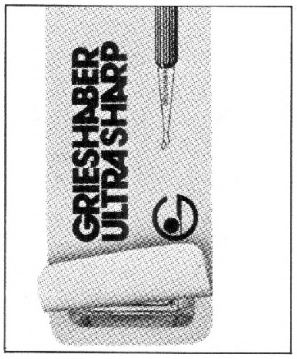

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