PUBLISHED QUARTERLY 786 ISSN 0886-3067

مجلہ طب العیون پاکستان

PAKISTAN JOURNAL OF OPHTHALMOLOGY

THE OFFICIAL JOURNAL OF THE OPTHALMOLOGICAL SOCIETY OF PAKISTAN

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APRIL, 1992 Volume 8, Number. 2

BISMILLAHIR-RAHMANIR-RAHEEM

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Khalid J. Awan, FPAMS

مجلہ طب العیون پاکستان

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THE OFFICIAL JOURNAL OF THE
OPHTHALMOLOGICAL SOCIETY OF PAKISTAN

April, 1992 شوال ۱۴۱۲ هجري **PUBLISHED QUARTERLY** **Volume 8, Number 2**

ISSN 0886-3067

EDITORIAL OFFICES INTERNATIONAL:
1921 Park Ave., S.W.
Norton, Virginia 24273
USA.
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Fax: 703-679-5736

PAKISTAN (INLAND ONLY):
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Publisher: Khalid J. Awan, M.D., F.P.A.M.S.

Sponsor: Pakistan Academy of Medical Sciences and Ophthalmological Society of Pakistan

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.

Replacement Issues-Policy: All requests for replacement of copies lost in the mail must be received within ninety (90) days of the last month the issue was published. After this period, a charge of $10.00 per copy will be made, provided the copies are available.

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.

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Say: Are the blind and the seeing man equal, or are the darkness and the light equal?
-Holy Qur'an 13:16

Operating Room Sterility and Ophthalmic Surgery

BismIllahir-Ruhmaanir-Raheem. For obvious reasons, absolute sterility of the operative field in eye surgery is not, yet, achievable. Nonetheless, the reports show that performing surgery in optimally aseptic surroundings dramatically reduces postoperative infection. This speaks for the utmost desirability of such surroundings in the ophthalmic operating theaters. Unfortunately, this aspect of surgical set up does not universally receive the required attention in Pakistan, where approaches and practices vary so widely in this regard that even a teaching institution's operating rooms may fail to meet the proper standards on a closer inspection; whereas, a charity eye hospital may provide an exemplary operating atmosphere for its patients.

No doubt, the use of antibiotics has significantly reduced the incidence of postoperative endophthalmitis. Even in earlier days, Lord Joseph Lister revolutionized the management of compound fractures and surgical practice in general by application of phenol (carbolic acid) in 1865 to exclude the airborne germs, just a year after Louis Pasteur first discovered the existence of microorganisms. This, however, did not improve the situation for eye surgeons, who in the late 1800s were forced to contend with postoperative infection in one tenth of their cases.[1] In the early 1900s, this incidence showed steady decrease from a little over 3% in the 1920s[2] to almost 1% in the 1940s[3] in the United Kingdom and, respectively, from about 1.6%[4] to almost 1%[5] in the United States. After 1950, some authors considered postoperative bacterial endophthalmitis "rare,"[6] and today its incidence is less than one tenth of a percent (0.05% - 0.09%).[7] Of course, the introduction of various broad-spectrum antibiotics has much to do with this. Nevertheless, there are other important factors which have significantly contributed to this happy turn of events. Also, as a recent report from Pakistan has confirmed,[8] the role of prophylactic antibiotics in prevention of postoperative infection is controversial.[8,9] Hence, to entirely depend on the use of antibiotics and not fully heed other measures is not only foolhardy it is also very dangerous.

In addition to the use of prophylactic broad spectrum antibiotics, other measures to achieve better asepsis, improved understanding of causes of infection, modern microsurgical techniques, and an enhanced awareness of the role of surgical team and operating room surroundings in prevention of infection, all have significantly contributed toward elimination of postoperative infection. Sources of infection at the time of surgery include: (1) preocular tear film or eyelids, (2) the respiratory flora of the surgeon and assistants, (3) instruments and devices, such as intraocular lens implants (IOL), donor corneas, etc. (4) solutions, and (5) ambient air.[10] Items 2 and 5 are perhaps the most neglected ones in some operating theaters in Pakistan. It is not unusual to find the entrance to the operating room literally blocked by a multitude of patients' kins hovering around the closed door, shoulder to shoulder crowding of small multiple-table operating rooms by as many as 20 assistants and trainees, surgeons freely walking in and out of the operating room, operators not covering their noses with masks, or surgeons operating without sterile gloves.

Some eye surgeons of our country have on occasion boasted of not having many postoperative infections. They forget that the fate of more than half of our surgical patients remains totally unknown, because they never return for follow-up. A hundred years ago, to study the sterilization of hands in the United States, surgical nurses were instructed to use a nail-brush and scrub the hands with soap and warm water, after which they immersed them in solution bichloride of mercury, 1 in 3000 or strong alcohol in ether. Scrapings from beneath their fingernails were then tested. "In only two instances were the hands found to be sterile; in *all* others bacteria were found."[11] I doubt if the situation is any better even today in some of our own operating theaters. We must actively strive for better. *-KJA*

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Camera Clinicals

In this section of THE JOURNAL, *photographic documentation of an interesting and challenging observation is persented to the readers. They should make their diagnosis from the given information, and compare their conclusions with the expositions given on pages 45 and 46.* -Editor.

Figure 1

Figure I: A 61-year-old woman came in with a complaint of poor sight and periods of mild redness and aching of eyes. An examination by an optometrist did not help her sight. Her past medical history was interesting in that she had suffered from hypochromic anemia for which her physicians could not find an etiology, despite repeated bone-marrow biopsies and very thorough testing by usual radiologic and laboratory techniques. Eventually, carcinoma of the ovary with metastases to the lung was suspected by sophisticated modern diagnostic procedures, and confirmed histologically following the removal of uterus and ovaries. Because of chronic arthritis, she regularly took aspirin. She also gave past history of a rough fall, which had caused bilateral orbital fractures. Luckily, no residual ocular problem had developed from these fractures.

On examination, her visual acuity was 20/100 (6/60) with best correction in each eye. External eye examination was normal. Slit lamp examination showed that there was an unusual gap between the iris and the lens in each eye. The iris appeared to touch the corneal endothelium in several areas in periphery. The lens showed cortical and nuclear cataract formation with interesting anterior subcapsular changes but without posterior subcapsular cataract formation. The intraocular pressure was 17 mm Hg in each eye. Ophthalmoscopy showed a subtle mottled depigmentation in the macula and central retina of the right eye and in two smaller areas, one superior to and the other

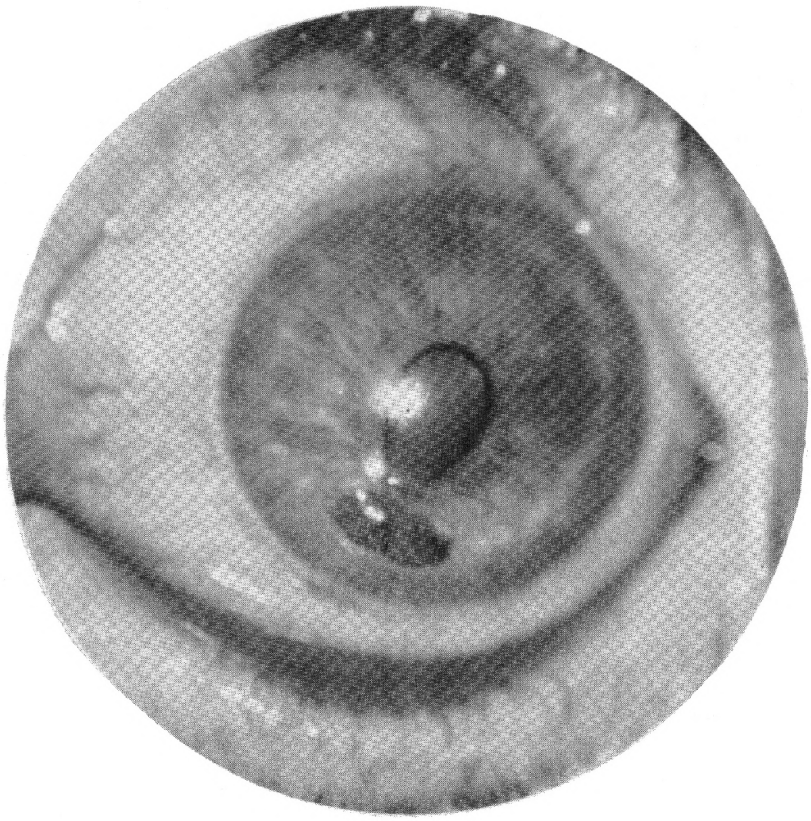

Figure 2

superotemporal to the left macula. Figure 1 shows the findings of direct gonioscopy through a dilated pupil all through 360° of the circumference. The dilatation of pupil elevated the intraocular pressure enough to warrant prescription of pilocarpine 1% drops q.i.d. in both eyes. A few weeks later, an extracapsular cataract extraction with a sector iridectomy and posterior chamber intraocular lens implantation improved the visual acuity to 20/40 in the left eye. The patient's health did not permit surgery on the right eye, which received first pilocarpine drops and then laser therapy.

Figures 2: A 67-year-old woman complained of sudden severe diminishing of sight with redness and burning of her left eye. On eye examination, her visual acuity was 20/40 (6/12) with glasses in the right eye and 20/200 (6/60) in the left. In the right eye there was a faint superficial curvilinear stromal corneal scar at six o'clock. The finding in the left eye are shown in Figure 2.

The patient had a long history of rheumatoid arthritis with disfigurement of hands and fingers. Because of previous diagnosis of severe keratoconjunctivitis sicca the patient was on artificial tear substitutes. The findings in Figure 2 required immediate medical care, which was provided at the nearby university center. In addition, the eye surgeon also did a temporal tarsorrhaphy. The patient's eye has done well since the surgery. Later, other eye also had temporal tarsorrhaphy.

President of Pakistan-OSP (Ramzan Ali Syed) Gold Medal-1992

Professor Mohammad Nawaz

Mr. President, the President of Pakistan-OSP (Ramzan Ali Syed) Gold Medal awardee for this year comes from a least expected and far-flung underdeveloped area of our country. That a worthy scion may be born to a seemingly barren land, and that genuine talent would not know material bounds are amply evinced by this year's choice for this honor. Hailing from a remote area situated in the farthest outreaches of the country, he was born on December 1, 1948. Receiving his basic education at the local high school, he found mental pabulum in the least conducive of environments, and proceeded to the provincial capital for pre-medical and then medical education. He completed his graduation from the Khyber Medical College, Peshawar in 1969 at the young age of 21, winning the President of Pakistan Award for outstanding position in the M.B.,B.S. finals. Next to come in a long list of laurels was a merit scholarship for postgraduate studies in the United Kingdom, to where he proceeded in 1970. Within a year, he obtained his Diploma in Ophthalmology from the University of London. He received training at centers like the Institute of Ophthalmology and Moorfields Eye Hospital, London, Birmingham and Midland Eye Hospital, Coventry and Warwick Hospital, and lastly, as the Senior Registrar, at the Royal Hallamshire Hospital, Sheffield.

In 1976, he obtained his fellowship from the Royal College of Surgeons of Edinburgh , and the following year he returned to motherland to be appointed the Assistant Professor of Ophthalmology in his alma mater at the young age of 29. He has since steadily progressed to his present position of the Professor and Head of Department of Ophthalmology at the Postgraduate Medical Institute of our province.

In a short span of time, he has authored 21 publications in the national and international ophthalmic journals, including the *Pakistan Journal of Ophthalmology*, the *British Journal of Ophthalmology*, the *Asia-Pacific Journal of Ophthalmology* and the *Afro-Asian Journal of Ophthalmology*. He has also been the principal or co-presenter of 32 papers at various national conferences and 7 papers at the international conferences. One of these papers won the coveted "Best Paper" award at the International Congress of Ophthalmology in Singapore in 1990, the first such award to be won by a Pakistani ophthalmologist.

He is currently serving on the editorial boards of five different national and international ophthalmic journals and holds the membership of 21 national and international professional societies and organizations, a few notables of which are:

Fellowship of the Pakistan Academy of Medical Sciences (PAMS) in 1990; Regional Representative of the Asia-Pacific Academy of Ophthalmology since 1985; Vice Chairman, the East Mediterranean Region, International Agency for Prevention of Blindness, once again the only one to so represent his country on this august body; Member, Council of International Federation of Ophthalmological Societies, yet again the only one representing Pakistan; Member Regional Advisory Board, World Health Organization for 1991-1992; and that rare honor to be made a member of the Programme Advisory Committee of the World Health Organization, a committee that consists of only eight members from throughout the world. He is the first Pakistani ophthalmologist to be so selected. Thus, he has not only earned laurels for himself but has also brought much recognition to his country.

That his quest for knowledge remains unsatiated is evident from his extensive professional traveling, which has so far taken him to India, France, Ireland, United Kingdom, Sweden, Denmark, Switzerland, Thailand, The Philippines, Japan, South Korea, Singapore, Malaysia, Maldives, Nepal, Gambia, Kenya and the United States of America. Some of these travels were made for fellowships and on scholarships, such as the laser and vitrectomy fellowship in 1987, comprising visits to various centers in France and the USA, including the Wilmer Institute, Johns Hopkins University, Baltimore; Wills Eye Hospital, Philadelphia; and the Department of Ophthalmology, St. Louis University, USA. In 1988, the Ethicon Foundation offered him a scholarship for visiting various centers in the UK. During these peregrinations, he attended 17 international conferences.

The versatility of his interest is evident from his research projects, which include ocular trauma, proptosis, intraocular lens implantation, ophthalmic lasers, exfoliative glaucoma, vernal catarrh, microbial keratitis, preventive and community ophthalmology, keratoconus, secondary glaucoma, cataracts, and dacryocystorhinostomy.

Not to be left behind on the social work front, he has participated in 15 free medical and surgical eye camps in the country and one eye camp abroad in Maldives on the invitation of the Government of Pakistan. It is through his personal consistent efforts that the Layton Rahmatulla Benevolent Trust (LRBT) is establishing an eye hospital in an underdeveloped area of our province, and of which a mobile surgical and medical eye care unit is already operative. He is a trustee of the LRBT and the in charge of its programme in this province.

To excel is his trait and, therefore, he has transformed his own department into a modern teaching center, equipped with the latest diagnostic and therapeutic facilities, making it a focus of attraction for the aspiring trainees in the area. His department has so far produced eight diploma (D.O.) holders, three fellows and eight members of the College of Physicians and Surgeons of Pakistan (M.C.P.S. and F.C.P.S).

Because of his progressive outlook, he has established the country's first and only Department of Community Ophthalmology at the Postgraduate Medical Institute, Peshawar with the financial and technical assistance of the Sight Savers, an international organization committed to prevention of blindness in the world. It may be pertinent to mention that this department has scientifically conducted and just completed the first ever population based survey on the prevalence of the causes and distribution of blindness in our province. He arranged for the training abroad of this department's senior personnel, and also established its links with the World Health Organization through his personal efforts.

It is remarkable that with such heavy professional commitments, he also can find time for his avocational interests. He is an avid reader of history, biography, religion, and current world affairs, and has an enviable collection of books on these topics.

On a personal level, he is a generous person, always eager to help, and a source of inspiration to those who come in contact with him. He is a very hard working man with a thinking mind and a great vision. These attributes have helped him acquire not only a national but also an international stature in the field of ophthalmology in mere short 12 years.

In view of all of the aforesaid professional achievements, academic excellence, and contributions to ophthalmology, the Awards Committee of the Society has decided to award the 1992 President of Pakistan-Ophthalmological Society of Pakistan Gold Medal, named after the late Professor Ramzan Ali Syed, to him. Ladies and gentlemen, I have the great honor and pleasure of announcing that he is none other than **Professor Mohammad Duad Khan.**

Role of Intraocular Lens Implant in Restoration of Sight in Usual and Unusual Circumstances*

Jamshed Hormuzshaw Wania Lecture**

Khalid J. Awan, F.P.A.M.S.

ABSTRACT: One may divide the history of artificial intraocular lens (IOL) into four periods: the age of myth, when in the ancient folklore and fairy tales magical crystals or precious stones gave the blind an extraordinary ability to see; the age of concept, when in the 18th century some maverick oculists conceived that cataract could be replaced by an artificial lens, but failed to practically achieve it; the age of realization, when in 1949 Ridley first successfully implanted an IOL following cataract extraction; and the age of refinement, the modern era in which IOL implantation has become a routine therapy for cataract. The greater part of credit goes to technological advances rather than to ideation in ushering in this modern period. The modern surgery uses the anterior chamber, the pupil, or the posterior chamber for the intraocular fixation of the lens implant. However, because of its superior record of safety and success, the posterior chamber IOL implantation has now become the most popular technique. This technique has also proved helpful in restoring useful sight in situations where previously it would not have been possible without resorting to very extensive and complex surgical procedures. Hence, a simple posterior chamber IOL implantation restored useful sight in a 67-year-old man with a 21-year old traumatic cataract and extensive fibrovascular adhesions of the anterior segment with only a small portion of the cornea remaining clear; a 16-year-old girl with a traumatic cataract and thick central vascularized capsulocorneal adhesions; a 64-year-old man with a subluxated traumatic cataract, vitreous prolapse in the anterior chamber, and glaucoma; and a 70-year-old man with bilateral cataracts, basal cell carcinoma that had completely destroyed the nose, and keratinization of the nasal conjunctivae from irradiation of this tumor. Finally, the possibility that the anticipated advances in laser corneal sculpting and photorefractive surgery might render the present day IOL implantation surgery obsolete in the future is most exciting. (Pakistan Journal of Ophthalmology 8:33-38, April, 1992.)

Fa-innahaa laa ta'mul-ubsaaro,
Walaakin ta'mul-qolooboollatee fissoodoor.

(There are those in whom)
It is not the eyes that are blind,
But blind are the hearts that are in the bossoms.

-Holy Qur'an 22:46

It is with a profound feeling of honor that I stand here today. True honor is making contributions that extend the horizons of one's profession and enhance the image of one's people. Jamshed made such contributions. He carved a niche of recognition for Pakistan Ophthalmology in the international ophthalmic circles, and in doing so spared no personal effort or means. He was the only Pakistani ophthalmologist who delivered the prestigious named lecture of a respected international ophthalmological organization, read the citation of its top gold medal awardee, and became its president at the same meeting. I want Hormuzshaw, Jamshed's son sitting in the audience, to know that we shall always cherish his father's memory and great accomplishments.

To be asked to deliver this Lecture in his memory is indeed a great honor for which I am most grateful to the Organizing Committee and the Society.

From the Department of Ophthalmology, University of Virginia School of Medicine, Charlottesville, and Awan Ophthalmology Clinic, Norton, Virginia.

* Presented at the 25th Annual Congress of the Ophthalmological Society of Pakistan, February 25-29, 1992, Peshawar, and funded by a grant from the PAMS (Pakistan Academy of Medical Sciences).

** The Jamshed Hormuzshaw Wania Lecture of the Ophthalmlogical Society of Pakistan is also accompanied by a Gold Medal for the Lecturer from Alcon International.

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Furthermore, it is a matter of great personal pride for me to be the first to initiate this worthy tradition.

Blindness is of two kinds. The one to which *Allah* has referred to in the verse cited at the beginning of this Lecture is a philosophical matter of mind and conscience, and leaving this to the understanding of each individual's own mind, I shall move on to discussion of the second type of blindness, the one that results from physical changes in the eye. It is a fact that the cataract is and has always been the leading cause of this type of blindness. It also is a fact that today the prevailing method of treating cataract is the intraocular lens implantation (IOL) surgery.

History of Lens Implant

It appears that a desire for an artificial device to restore sight has existed from the very beginning of recorded history of man. Hence, one finds in Greek mythology the mention of a "crystal" which restored the sight of Stygian Witches when placed in the single blind socket in the forehead.[1] However, the concept of restoring sight by implanting an artificial lens inside the eye as we know it today dates back to 1766, when Giovanni Giacomo Casanova de Seingalt (1725-1797), the notorious Italian amorous adventurer who also was a traveller and historian, made a mention of this in his memoirs, *Historie de ma vie* (translated in English by Willard R. Trask under the title of *History of My Life*). Casanova had a special interest in medicine, and during one of his travels he met a Polish oculist of Warsaw named Tadini, whom academicians of his time had labelled as a charlatan. In one passage of his memoirs, Casanova tells of his learning of Tadini's idea of replacing the crystalline lens in an aphakic eye with a highly polished crystal. For his concept, Tadini was ridiculed in an article by a professor of medicine in Warsaw, who scoffed at the idea of artificial lens implant, and likened it to the replacement of a tooth by a false one.[2] Tadini received sarcasm instead of support from most of his peers, and was obviously in advance of his own time.

The first actual attempt at lens implantation in an aphakic eye was made by Casaamata of Italy in 1797. Unfortunately, the glass lens fell into the vitreous as soon as Casaamata let go of it inside the eye.[3] This discouraged him and others from any further attempts at implantation of artificial lenses for the next one and a half century.

A decade before the father of present era of intraocular lens implantation gave it a new start, an article titled "An Oculist in America," by John Foster appeared in *Leeds Medical Society Magazine*. In that article Foster highlighted the prevailing skepticism about the intraocular lenses by suggesting that only Americans could afford to spend large sums and time in a futile research for such an impossible device.

The modern era of intraocular lens implantation began exactly a decade after the publication of Foster's article when, ironically, one of his own countrymen became the first to perform a successful intraocular lens implantation. Ridley[4,5] of England successfully implanted the first modern artificial intraocular lens following extracapsular cataract extraction on November 29, 1949 in the left eye of a 45-year-old woman with monocular cataract. Ridley's original lens was a circular disc made of fully polymerized polymethylmethacrylate (PMMA), commercially known as Transpex I (I.C.I.), with a refractive index of 1.49 and specific gravity of 1.19.[5] (In the original publication of Ridley it was stated that the lens was made of *unpolymerized* polymethylmethacrylate.[4]) It measured 8.3 mm in diameter (about 1 mm smaller than the natural crystalline lens), 2.4 mm in thickness, 17.8 mm in anterior radius of curvature, 10.7 mm in posterior radius of curvature, +74 diopters in power in air, and +24 diopters in power in aqueous (refractive index 1.33). The implant was placed between the iris and the posterior capsule. Ridley presented early results of his operation on 27 patients varying in age from 12 to 84 (most of them above 55) at the Oxford Congress of Ophthalmology in July 1951.

Ridley's indication for his lens implantation was a monocular cataract in middle aged persons. Despite a lukewarm general reception, this operation became a *cause celebere* for a few ophthalmic surgeons scattered all over the world, including the Subcontinent Indo-Pakistan, where Gupta published his experience with IOL in 1953 (*Ophthal J Gandhi Eye Hosp* 3:13, 1953).[6] Interestingly, one of the earliest intraocular lens implantations Ridley performed was on an officer of the Northwestern Railway of Pakistan in 1953. Still alive, this patient appeared as one of the invited speakers at the recent (1989) Annual Congress of the Ophthalmological Society of Pakistan at Lahore. He gave a most interesting account of his monocular loss of sight and how it interfered with his activities, his overseas travel to London to consult a certain Dr. Ridley at the recommendation of his ophthalmologist in Pakistan, the intraocular lens implantation operation, an overall trouble free postoperative course, and the outcome of surgery which he found to be extremely satisfactory from his point of view. He amazed his captivated audience when he declared that even today, 36 years after the operation, the visual acuity in his eye with the implant was 6/9 (20/30).[7]

Such impressive results were not, however, the usual outcome of the Ridley operation, and disasters and disappointments were many more than what could be regarded as acceptable. Ridley[8] himself reported that 15% of his implants had to be removed due to various complications. The high incidence of postoperative uveitis, glaucoma, posterior capsular opacification, and dislocation of the implant eventually forced Ridley to abandon his posterior chamber lens in 1960.[9] Nevertheless, a few ophthalmologists were convinced that the flaw was with techniques and technology and

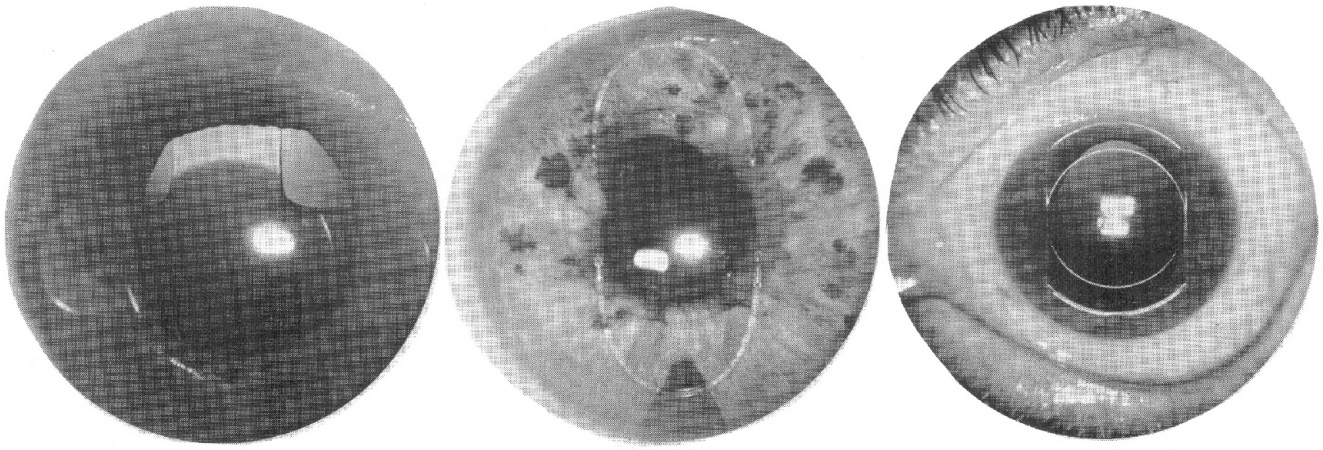

Figure 1 (Awan): A. Left, Copeland cross pupillary IOL in place showing two haptics in front and two behind the iris; B. Center , pupillary iris clip IOL; C. Right. Anterior chamber IOL. Note the circular haptic in front of the pupil and solid feet of the lens resting in the anterior chamber angle.

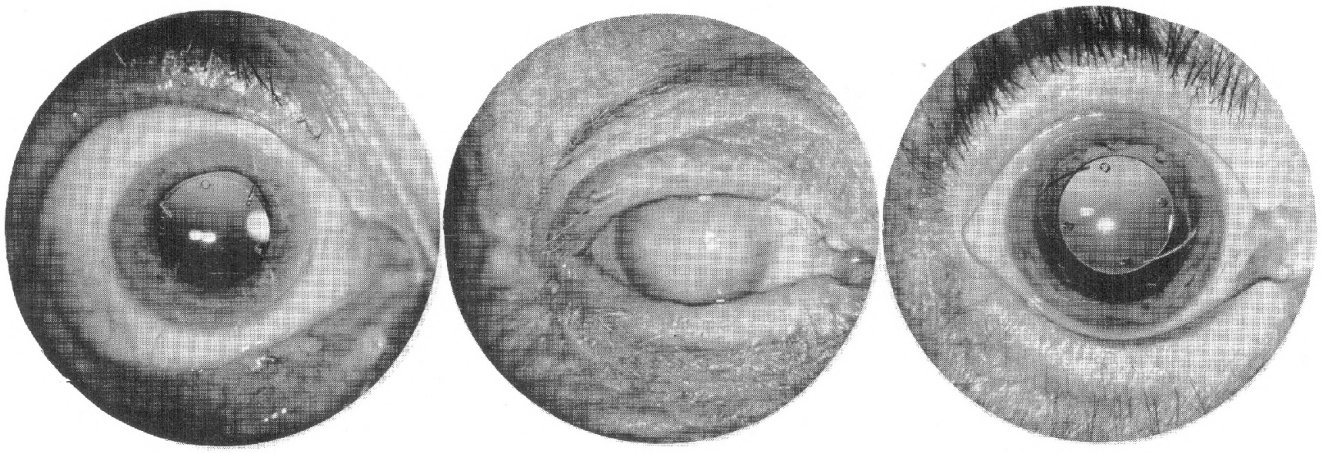

Figure 2 (Awan): A. Left. An AC-IOL with flexible closed-loop haptics ; B. Center. Same eye with total decompensation of cornea after two years; C. Right. A posterior chamber IOL with "in-the-bag" fixation. The loops are open ended which prevents vaulting of the implant.

not with the concept of artificial lens implant itself, and they stubbornly kept up the struggle to find a better lens to supplant Ridley's implant.

In 1953, Strampelli[10] of Italy introduced the first rigid anterior chamber lens implant. In 1959, C. D. Binkhorst[11] from Holland and E. Epstein[12] of South Africa reported on their independently designed lenses which supported by the iris were held in the pupillary space ("pupillary lens"). Many others followed their lead and designed numerous shapes and styles of pupillary and anterior chamber lenses, some with flexible haptics. By 1978, 70% of the implants in the United States were the iris-supported or iridocapsular lenses.[13] These implants were not without serious complications, and as they went into decline, the use of angle-supported anterior chamber lenses gained more popularity. By 1983, 40% of lenses implanted in the United States were of this type.[13] However, these too had serious problems peculiar to them, which led many to revert back to Ridley's original concept of physiologic site for the artificial lens. Pearce[14] led the surgeons in resuming the extracapsular cataract extraction with posterior chamber IOL implantation. In 1978, Shearing[15] published a report on the first design of posterior chamber lens with rigid J-shaped haptics. Soon, others followed with its modifications with flexible J-shaped or C-shaped loops for haptics. This brought on a major revolution in IOL implantation, and hundreds of designs of posterior chamber lenses appeared on the scene. The superior results of the posterior chamber IOL implantation increased its popularity to 70% in 1984 from the mere 4% in 1976 of all the implanted lenses in the United States. Today, over 90% of lens implants are of posterior chamber type. The tremendous progress in the technology of extracapsular cataract extraction is now encouraging some pioneers of IOL surgery to go back to the original design of a disc lens that may be

placed inside the lens capsule.[16,17]

Lens Implant Fixation Techniques

Ridley employed the intact posterior capsule and the postoperative fibrosis to hold the freely inserted artificial lens in its space. As time went on, other techniques for a more secure intraocular fixation of the pseudophakos evolved. In pupillary lens implantation, specially designed implants are placed in the pupillary aperture, and held there by haptics or loops that extended beyond the margins of a dilated pupil. In some designs, alternate of the four haptics are placed in front and behind the pupil; in others, the superimposed loops simply grasp the iris between them (Figures 1A and 1B). Dissatisfaction with pupillary implants led to the advent of anterior chamber lenses. The implant is placed in the anterior chamber and held in position by its tips resting against the scleral wall of the anterior chamber angle (Figures 1C and 2A). However, these implants are also not trouble free, and in some instances may even lead to a total opacification of the cornea (Figure 2B). The modern posterior chamber implant is held in position by two flexible J- or C-shaped loops which rest in the iridociliary sulcus or "in-the-bag" (i.e. in the fornix of the capsular bag). Compressed inward against the scleral wall or the lens capsule, these loops create just the right amount of elastic force to hold the implant in position (Figure 2C). There are other styles of implants which either combine or modify these three principles of lens fixation. One anterior chamber design rests entirely on the iris by pinching its tissues in its claw-shaped haptics.[18,19] There are available today hundreds of fully approved designs of intraocular lens implants, an overwhelming majority of which are of posterior chamber type. Most recently, in some cases the surgeons are fixating the posterior chamber lenses with strategically placed scleral wall sutures.[20,21]

The Future of IOL

Although research in medical prevention or slowing the progression of cataract still goes on, the surgical cure of cataract has taken giant forward strides. The mind-boggling advances in the extracapsular cataract extraction techniques, availability of the newer biocompatible refractive materials, advent of medical lasers, progress in keratorefractive surgical procedures, etc. predict an almost magical, and not very far, future for cataract surgery. Most of this is based on the extracapsular extraction of cataract, an idea that was conceived and practiced by Muslims nearly a thousand years ago. Duke-Elder[22] writes that Rhazes (865-928] and Ammar (996-1020) "advised 'tearing the cataract to pieces' by a needle and, if it were possible, sucking out the soft lens matter through a hollow needle." He further expounds that "Ammar [996-1020], the most original of the Arabian School, inserted a hollow needle and sucked out the opaque material of a soft cataract." Today, the only new thing about this idea is the marvelously advanced technology that has made available extremely refined cannulas, tubing, microscopic magnification, coaxil bright illumination, and mechanical devices that render the sucking of cataract quick, clean, and uncomplicated.

Lens implants that will require only a few millimeter incision to insert them are already headed toward the market. This is achieved by folding a lens made of silicone into a smaller size and then unfolding it once it is inside the eye,[23] by inserting a dehydrated lens of hydrogel that expands inside the eye by becoming hydrated again, or by employing PMMA implants with optic of smaller width with lateral semiopaque hinged wings that are folded to push the lens through a smaller incision.[24] Then there are lenses that block the ultraviolet (UV) spectrum to protect the eye.[3] Soon, IOl implants will be available that are multifocal.[25,26] These lenses either have a small central button for near vision and larger peripheral surrounding area for distant vision, more than two multifocal zones, or many zones of gradually changing multifocal areas (called microslope design). If successful, these lenses could eliminate altogether the need for glasses after cataract surgery. Even more astonishing is the possibility that lens material could be ablated through a small hole with excimer laser and then sucked out, leaving behind clean capsular bag that could be refilled with a suitable injectable refractive material, permitting the eye to make use of its own accommodative ability. This idea, however, requires a large number of problems to be solved before becoming practical, though photoabalation of lens has already been achieved in the laboratory animals.[27] Another very interesting development may render the use of IOL altogether obsolete in the future, when corneal sculpting with laser or the use of intracorneal lenses after the suction of both the cortex and the capsule may restore the refractive power of the eye.[28]

Modern IOL in Unusual Circumstances

The modern posterior chamber lens implantation surgery is also valuable in restoring sight in situations where it could only be accomplished before by much more complex and extensive surgical procedures, provided no complications of their own ensue such repairs. I was able to restore useful vision in several patients by implantation of IOL in eyes with cataracts and extensive disorganization of the structures.

CASE 1: A 74-year-old man had 21-year old traumatic cataract in right eye with anterior segment scarring with thick vascularization, leaving only a small portion of the superior cornea clear. Visual acuity was only hand motion. The patient suddenly lost sight to a vascular accident in his good left eye. Because ultrasonography showed the retina to be free of changes, I did a simple aspiration of the cataract with posterior chamber IOL implantation behind the clear corneal sector (Figure 3). The patient is happy with the outcome, and has 20/100 (6/30) visual acuity two years after the surgery.

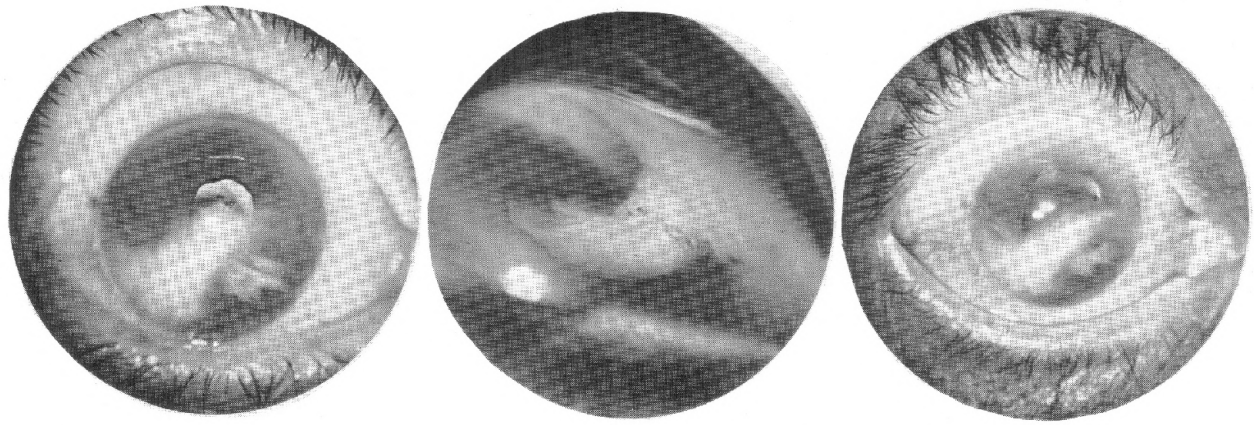

Figure 3 (Awan): Case 1. A, left. The external view of right eye, B, center, gonioscopic view showing thick vascularized adhesions between the lens and the cornea; C, right, Note the posterior chamber IOL behind the upper clear portion of the cornea.

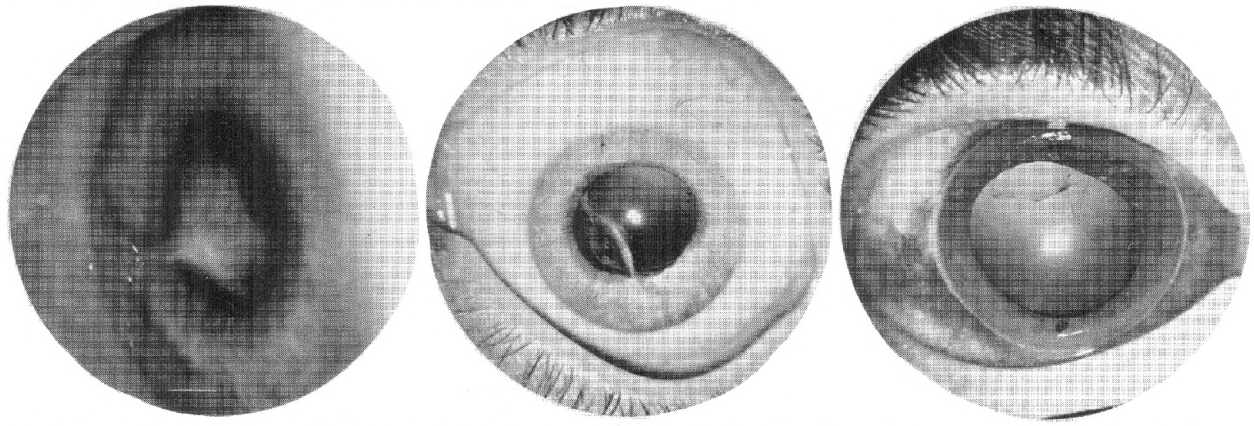

Figure 4 (Awan): Case 2. A, left, Note thick vascularized adhesion between the cornea and the injured lens; B, center, after cataract aspiration and posterior chamber IOL implantation; C, right, Case 3. Note vitreous prolapse into the anterior chamber superiorly.

CASE 2: A 16-year-old girl suffered a perforating eye injury of the left eye from a piece of rock that flew out from a lawn mower. Because of neglect in seeking medical help, the eye developed a cataract and thick, vascularized keratolenticular fibrous adhesions. Six months after the injury, the vision had reduced to only hand motion and the mother brought her to me. I obliterated the vesssels in the scar tissue with argon laser and the next day performed simple excision of the scar tissue in the anterior chamber, aspiration of the cataract, and a posterior chamber IOL implantation (Figure 4, A and B). The girl saw 20/40 (6/12) from that eye on the first postoperative day. The visual acuity is 20/25 (6/9) one year after the operation.

CASE 3: A 59-year-old man suffered blunt trauma to his right eye with subluxation of the lens and prolapse of the vitreous in the anterior chamber at 1 o'clock (Figures 4,C and 5,A). Eight months after the injury the lens became cataractous. I performed anterior vitrectomy and extracapsular cataract extraction through an incision made in the sector nearest to vitreous herniation into the anterior chamber. This left the intact portion of the zonule undisturbed. I inserted a posterior chamber IOL in such a way that the leading haptic rested on the intact capsule in-the-bag. I sutured the other haptic to the sclera behind the iris. The final visual acuity is 20/40 (6/12) without glasses 22 months after the operation.

CASE 4: A 64-year-old man became blind due to bilateral cataracts. Unfortunately, basal cell carcinoma had totally destroyed his nose and irradiation therapy of the tumor had left the nasal conjunctiva of both eyes keratinized, hence precluding the use of both the glasses and the contact lenses. I did intracapsular cataract extraction and implantation of "iris-clip" lens in both eyes (Figure 5, B and C). The unaided final acuity three years after the surgery was 20/60 (6/18) in the right eye and 20/50 (6/15) in the left eye.

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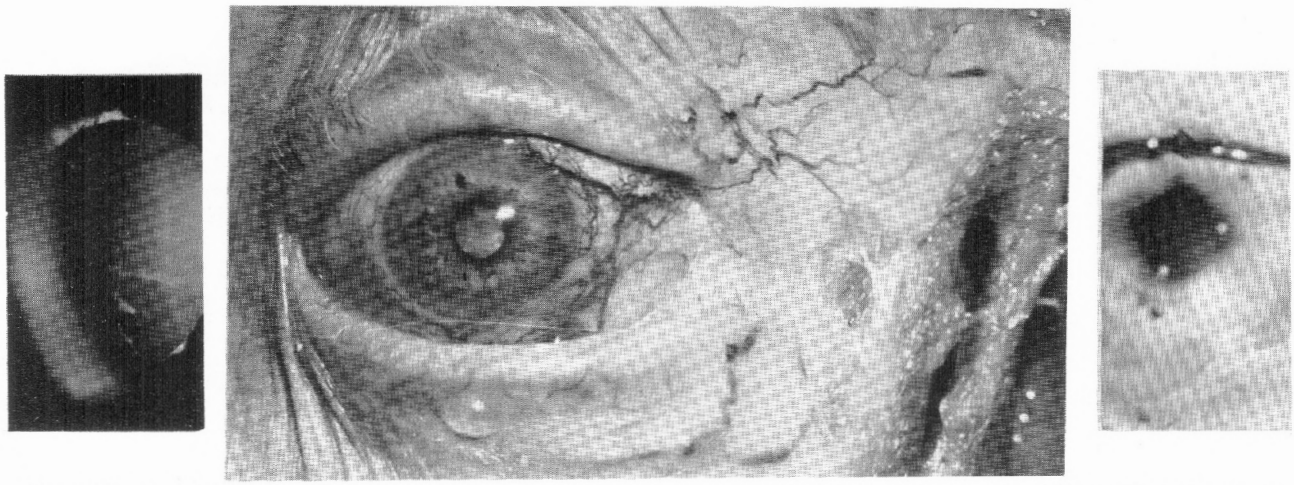

Figure 5 (Awan): A, left, Slit lamp view of subluxated lens and the prolapsed vitreous in anterior chamber in Case 3; B, center. Case 4. Note total destruction of nose from basal cell carcinoma, keratinization of nasal conjunctiva from irradiation, and cataract in right eye; C, right, Case 4, the eye after iris-clip IOL implantation.

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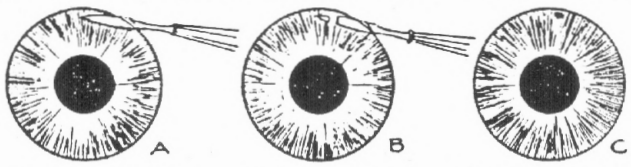
Ophthalmic "Pastpourri"

First Iridotomy for Angle-closure

At the beginning of this century, E. J. Curran felt that the filtering procedures, like that of Elliot, did not make "the full use of the canal of Schlemm." He argued that a simple hole in the iris would be sufficient to allow the aqueous from the posterior chamber to enter into the anterior chamber and leave via the canal of Schlemm, resulting in the cure of glaucoma at least in patients in whom this structure was not damaged or blocked. The steps of his technique for iridotomy are shown below in reproduction of the original drawing that accompanied Curran's paper.



In September of **1916**, Curran performed his operation on a patient with acute angle-closure. The glaucoma was cured and the patient recovered a visual acuity of 20/30 (6/9). This prompted Curran's study of iridotomy in other patients and eventually resulted in his classic publication which appeared in 1920. As happens with many new ideas and discoveries, Curran's operation and paper both were ignored by the elite. With time, the worth of Curran's operation and his reasoning behind it became apparent, and Professor Harold Gifford declared that he had tried iridotomy on his own patients and found it "the simplest and most satisfactory thing imaginable."-*KJA* 149-13120

Dacryocystorhinostomy with and without Intubation

Mushtaq Ahmad, M.D.

ABSTRACT: During a retrospective study of 100 dacryocystorhinostomy (Dupuy-Dutemps' technique) cases, 86 replied the questionnaire that was sent to them, and 60 patients, 35 (58.3%) men and 25 (41.7%) women, came in for an interview. Of the 60 patients who were interviewed, 55 (91.7%) had dacryocystorhinostomy with intubation and five (3.7%) without it. The successful outcome of surgery meant the symptomatic relief from epiphora and dacryocystitis and a patent nasolacrimal tract upon syringing. Of the intubated cases, 53 (96.3%) were successful and two (3.7%) failed. Four of the cases (80%) without intubation were successful and one (20%) was not. Our combined success rate after primary dacryocystorinostomy with and without intubation is 95%, which is quite compatible with previous reports. (Pakistan Journal of Ophthalmology 8:39-42, January, 1992.)

Persistent epiphora resulting from defective tear drainage in the area of nasolacrimal duct is a vexing problem that usually requires surgical intervention to create an alternative passage for the lacrimal drainage. Dupuy-Dutemps' technique of dacryocystorhinostomy has for over half a century remained the most popular surgical procedure to relieve persistent epiphora caused by an obstruction in the nasolacrimal duct.[1,2] Numerous modifications in various surgical steps of the original dacryocystorhinostomy (DCR) operation have been introduced over the years, without really altering its basic concept.

Chronic dacryocystitis is a common ocular disorder in Pakistan, perhaps due to dusty atmosphere and prevalence of trachoma. The purpose of this communication is to report on the results of a series of cases of DCR with intubation and without intubation. These results were compiled by the author during his postgraduate training abroad.

Materials and Methods

This study is based on examination of medical records of 100 consecutive patients who were operated upon at the Bristol Eye Hospital during 1984 to 1988. Various members of the consultant and trainee staff operated on these patients. The maximum follow-up of these patients was five years and the minimum five months. The age of the patients ranged from 3 to 86 years (mean 44.5 years). Most of the patients were in the age group 50-70 years.

The patient's name, admission number and type of surgery performed were identified from the operating theater register and their chief symptoms, investigations and follow-up from their medical record.

The patient assessment proforma included details of presenting complaint, age, sex, diagnosis by the examining ophthalmologist, and the types of investigations performed preoperatively. The condition at the time of admission, type of anesthesia used, operative technique, complications during operation, immediate postoperative complications, and condition at the time of discharge were also recorded.

To evaluate the success of DCR, a letter with a questionnaire was sent to all patients in this study. The patients were requested to return for an interview and syringing to evaluate the patency and efficiency of the lacrimal drainage apparatus.

Out of a total of 100 patients in this study, 86 patients returned the filled out questionaire. However, out of these 86 responders 20 did not show up, five were deceased, and one was out of the country, leaving only 60 for the interview and syringing.

PREOPERATIVE INVESTIGATIONS: The standard dilation with a punctum dilator and probe followed by irrigation of lacrimal passages with a cannula on a fluid filled syringe formed the basis of preoperative evaluation of the site and degree of obstruction, and was regarded sufficiently accurate and reliable in the vast majority of cases.

Dacryocystography (DCG) did not usually provide more useful information than did the irrigation, and its use was, therefore, restricted to complicated cases of facial trauma, failed DCR and other cases in whom the localization of obstruction was not clearcut on

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syringing. In this series, 23 (38.3%) of the patients had DCG.

Of the 60 patients who came in for postoperative evaluation in reply to our request, the obstruction had been in the lower part of the sac or the upper end of the nasolacrimal duct in 52 (86.7%) and in the canalicular section in the remaining eight (13.3%).

Preoperative microbiological culture showed that *Staphylococcus aureus* was the most common organism (22%) among those who grew pathogens in culture medium.

ANESTHESIA: We operated on our 90 (90%) of the patients under general anesthesia and 10 (10%) under local anesthesia.

OPERATIVE PROCEDURE: The operative procedure (primarily the technique popularized by Dupuy-Dutemps) in patients included in this retrospective study was formation of anterior and posterior flaps of the lacrimal sac and the nasal mucosa, and then insertion of O'Donoghue's tube into the nose through the opening in the nasal membrane and sac. The tube was removed at a variable interval after surgery.

POSTOPERATIVE CARE: Postoperative care was simple in our cases. Bedrest was not necessary. Bathroom privileges and regular diet were allowed soon after the operation.

Results

Out of a total of 60 patients who returned for examination, 35 (58.3%) were females and 25 (41.7%) were males, including one under the age of ten.

There was a slight preponderance of obstruction on the left side over the right side, 30 and 24 patients respectively. Obstruction was bilateral in six patients. The cause of lacrimal obstruction remained unknown in a majority of cases. Preoperatively, 47 (78.3%) of them had presented with epiphora and pussy discharge at the medial canthus, eight (13.3%) with lacrimal sac mucocele, three (5%) cases with acute-on-chronic dacryocystitis, and two (3.3%) with facial trauma.

SUCCESS RATE: The criteria of success in this retrospective study were a relief from epiphora, absence of symptoms suggestive of dacryocystitis, and a patent lacrimal tract as demonstrated by syringing.

Out of 60 DCR cases, 55 (91.7%) were intubated, 53 (96.3%) with successful and two (3.7%) with an unsuccessful outcome. In five (8.3%) cases who did not have intubation, four (80%) were successful and one (20%) failed.

Our overall primary procedure success rate was 95%. The success rate is high with intubation. There were eight cases of canalicular obstruction. All of them were cured with intubation. In this series there were no repeat operations.

COMPLICATIONS: Operative bleeding either from the angular vessels or nasal mucosa occurred in a few cases, but it was easily controlled.

No patient had severe postoperative nasal bleeding. Mild bleeding occurred in a few cases which was controlled by nasal packing.

Discussion

The recognized procedure for relief of obstructive epiphora due to a blockage in the distal part of the nasolacrimal apparatus is DCR. This operation is indicated in many patients suffering from obstruction of the nasolacrimal duct, chronic dacryocystitis, and also patients with a flaccid lacrimal passage. The success rate depends upon the type of procedure used and the competence of the surgeon. Obstruction in the lower portion of lacrimal sac or in the nasolacrimal is amenable to DCR, but any obstruction proximal to this cannot be cured by DCR alone. Hence, a preoperative determination of obstruction site is very important in the selection of a surgical procedure.

A preoperative examination by an otolaryngologist may be ideal, but in our series no patient had preliminary examination by an ear-nose-throat (ENT) specialist, and we also did not find any ENT abnormality during the operation. It is also worth noting that not a single patient reporting to the ENT department with nasal symptoms was ever referred to the Eye Hospital for treatment of dacryocystitis.

The regurgitation of purulent material from the puncta when pressure is applied over a dilated sac indicates a blockage at the lower end of the sac or in the nasolacrimal duct. If there is no regurgitation when pressure is applied on the dilated sac, it means that there may be occlusion of puncta or canaliculus. This may be tested by probing and syringing.

The male to female incidence ratio in our study almost agrees with that mentioned in other reports in the literature, i.e. 3:1 female to male.[3,4]

There was a slight preponderance of the disease on the left side in our series, which agrees with the report of Milverton.[5] In his series of 246 DCR cases, a left sided operation was performed in 57% and right sided operation in 43%, and of these 5% had bilateral operations, while in our series 50% were left sided, 40% were right sided and 10% were bilateral.

Two cases of trauma in our series were both men, which agrees with the report of Adenis et al.[6] They showed that trauma is more common in men than in women (19 out of their 25 cases were men.)

In our study syringing was the most commonly used investigation. This test was sufficiently accurate and reliable for assessment purposes in the vast majority of our cases. Many authors agree that information gained from this simple test is sufficient in itself.[7]

Many other diagnostic tests are available to assist in the diagnosis. In most straightforward cases, probing and irrigation of lacrimal passages can provide sufficient information about the site of obstruction. In these situations, dacrycystography (DCG) does not give any advantage over the standard syringing.

Therefore, DCG is best saved for more complicated cases, such as those due to trauma, prior failed DCR, etc. During our study we developed a similar feeling about DCG's value as compared to simple irrigation. Other techniques are more difficult to perform and interpret, i.e. lacrimal scintillography and subtraction macrodacryocystography (SMDCG). Amanat et al[8] recommended that SMDCG should be done only if lacrimal scintillography fails to diagnose the site of obstruction.

In our retrospective study of 60 cases, DCG was performed on 23 (38.3%) of cases. Out of 23 cases, eight had obstruction (13.3%) at the canalicular level. In the remainder the proximal lacrimal pathways were patent and the obstruction was either at the level of the sac or the nasolacrimal duct. The most common sites of obstruction in our study were the upper end of the nasolacrimal duct and the lower end of the sac.

Campbell[9] opined that approximately 20% of patients presenting with epiphora have obstruction of lacrimal drainage apparatus involving the upper part of the sac or the canalicular area. Our results agree with him, but do not agree with the results of Amanat, Hilditch, and Kwok[10] on canalicular obstruction. They did not find that nasolacrimal duct obstruction was the most common cause of epiphora, and reported canalicular blockage to be more common than nasolacrimal obstruction as the cause of epiphora in their patients.

Microbiological culture results of this study agree with the results obtained in the North West Frontier Province of Pakistan, where culture reports, like that of this study, found *Staphylococcus aureus* to be the most common pathogenic microorganism isolated from dacryocystitis cases.

Good anesthesia is essential in lacrimal surgery. DCR can be done under local anesthesia or general anesthesia. The choice of anesthesia usually depends on the age of the patient, his general health, and the preference of the surgeon. In our study, 90% of the patients had surgery under general anesthesia and 10% under local anesthesia.

In Pakistan, most surgeons prefer to operate on their adult patients under local anesthesia, because it is easy to administer and, when properly administered, as effective as general anesthesia. Infiltration with Xylocaine plus adrenaline reduces hemorrhage. Furthermore, local anesthesia is relatively inexpensive and comparatively safer.

The operative procedure in this study was formation of anterior and posterior flaps of the lacrimal sac and nasal mucosa, accompanied with insertion of O'Donaghue's tube in a large majority of patients. In Pakistan, we usually form an anterior flap of the nasal mucosa and lacrimal sac, approximate and suture them together with 4-0 plain absorbable (collagen) suture on an atraumatic quarter-inch half-circle needle. We usually close the skin incision with three interrupted 4-0 black silk sutures on an atraumatic needle. Also, we prefer to inject saline through the canaliculus into the nose at the end of surgical procedure. This maneuver not only enables the patient and the surgeon to enjoy the relief of knowing that the new passageway into the nose is patent, but at the same time it also washes away any blood clots in the newly formed passageway. An antibiotic ophthalmic ointment (polymyxin B and bacitracin) is instilled inside the lids and along the skin incision. A simple dressing is placed over the closed lids. The nasal pack is removed at the completion of the operation or sometimes on next day. We expect some oozing as the hemostatic effect of epinephrine in the anesthetic solution wears off.

Leone[11] introduced the use of a gelfoam thrombin stent to achieve hemostasis in DCR. This stent reduces postoperative bleeding and does not need to be removed. It is a sterile non-antigenic sponge prepared from purified gelatin solution. Before putting it in the rhinostomy site, the sponge is soaked in 5000 units of thrombin solution. Thrombin clots blood fibrinogen directly. The gelfoam liquifies completely and disappears within two to five days. This technique is not in wide use at the present, but may become more popular in the future.

In Pakistan, the majority of patients leave hospital within three days. However, at our hospital, we have found that the patient could be discharged on the first postoperative day, and advised to return on the fifth day for suture removal.

The majority of our cases did not receive systemic antibiotic, except those in whom the operation was undertaken in the presence of mild inflammation. Only local antibiotic were applied. Similarly, in Pakistan only those patients in whom the operation was undertaken in the presence of subacute inflammation receive systemic antibiotic. In other cases we only use local antibiotic in the form of ointment.

For post operative irrigation of lacrimal apparatus different authors have advocated different routines. Stallard[12] and Roper-Hall[13] recommend that inferior canaliculus should be irrigated with saline on the sixth post-operative day and carried out daily for ten days. Summerskill[14] maintains that during the first postoperative week there is nothing to be gained by irrigation of the inferior canaliculus, and that by doing so the healing process might be disturbed. Our practice in Pakistan is to irrigate the inferior canaliculus on the operating table after completing the operative procedure and after one week to demonstrate the drainage is satisfactory and to wash away any debris or blood clots. Irrigation is repeated after six weeks. If the lacrimal apparatus is patent at that time, the success of operation is established and no further treatment is required. A formal study of dacryocystitis and its surgical management in Pakistan is underway.

In this retrospective study of 60 patients, the success rate of 95% has been achieved with a primary DCR

Table
Success rate in other DCR studies

Author	Cases	Success (%)
Dupuy-Dutemps and Bourguet (1922)[1]	1,000	94.0%
Hallum (1949)[2]	60	94.8%
Pandey (1967)[15]	35	91.4%
Milverton (1980)[5]	246	92.3%
Khan and Kundi (1983)[16]	200	97.0%*
Burn and Cahill (1985)[17]	122	89.0%
Burn and Cahill (1985)[17]	122	94.0%*
Welham and Wulc (1987)[18]	204	96.0%*
Cernea and Georgmaneano (1987)[19]	104	96.2%
Adenis, et. al (1987)[6]	165	94.8%*
Ahmad (1989)	60	95.0%**

* Results after performing repeat surgery on cases which failed after the primary procedure.
** The present study.

procedure, which compares favorably with results of other workers (Table). We also feel that a repeat procedure in our failed cases would have made our results even more successful.

Conclusions

1. Adequate preoperative investigation is important in making surgical decisions about cases of epiphora. Among preoperative investigations, syringing done at the time of admission and also on the operating table is most informative and yields a correct diagnosis in a majority of cases.

2. For proximal obstruction, DCR alone is not sufficient, and intubation is necessary in all cases of canalicular obstruction.

3. The success rate of DCR with intubation was 100% in our eight cases of canalicular obstruction.

4. With careful attention to operative technique and with intubation, our overall success rate was 96.3%. This could be improved even more by repeat surgical intervention on failed DCR cases.

5. It is not possible to ascertain the definitive value of DCR without intubation from the results of present study. Only five patients had DCR without intubation. However, of the 55 patients with intubation, 53 had long term relief from epiphora.

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Postoperative Intraocular Pressure Rise in Aphakic and Pseudophakic Eyes at the Rawalpindi General Hospital

S. Imtiaz Ali, F.R.C.S., and M. Naqaish Sadiq, D.O.

ABSTRACT: Out of a total of 915 patients, ranging in age from 40 to 65, who underwent unilateral cataract extraction (intraocular, 54 eyes, planned extracapsular, 715 eyes, and extracapsular with posterior chamber intraocular lens implantation, 146 eyes), 549 (60%) did not return for follow-up. In 366 patients who kept their follow-up appointment, we carefully monitored postoperative intraocular pressure (IOP). In first two postoperative weeks, IOP remained elevated to 22-30 mmHg in 14 (5%) and to higher than that in seven (3%) of the extracapsularly aphakic eyes. In pseudophakic eyes, IOP elevation to 22-30 mmHg occurred in 16 (20%) eyes and to more than that in six (7%) eyes. In 29 intracapsular cataract extractions, no eye developed postoperative IOP elevation. All of the eyes in our study had normal IOP (<21 mmHg) before surgery. Overall, out of a total of 366 post-cataract extraction eyes, 43 (12%) showed a significant rise in IOP in first two postoperative weeks. Retained lens matter in pseudophakic eyes and postoperative inflammation in extracapsularly aphakic eyes were the most common causes of IOP elevation. Pupillary block glaucoma occurred in three extracapsularly aphakic eyes, two of these with a posterior chamber implant (Pakistan Journal of Ophthalmology 8:43-44, April, 1992.)

Rise in intraocular pressure (IOP) in the postoperative period following cataract extraction is well-recorded. Fortunately, this elevated IOP in the early postoperative period, which according to the western reports may occur in 33% to 100% of the cases, [1-3] is transient in most of the patients. Nonetheless, in susceptible patients even this temporary rise in IOP may cause optic nerve damage, particularly in preoperatively glaucomatous eyes.[4] It is then important to carefully look for this complication following cataract surgery.

No published data regarding this complication are available in Pakistan. We planned a study to evaluate its incidence in patients undergoing cataract extraction at the Rawalpindi General Hospital, Rawalpindi Medical College. The purpose of this article is to report findings of this study.

Materials and Methods

The patients who had cataract extraction from January 1, 1991 to November 30, 1991 in the Department of Ophthalmology, Rawalpindi General Hospital, Rawalpindi Medical College were included in this study. We excluded all patients with confirmed glaucoma, inflammatory intraocular disease, trauma, or any other local disorder that may by itself induce IOP elevation. A total of 915 unilaterally operated patients were included in the study. However, 549 (60%) of these did not return for follow-up. Hence, the final results of study were drawn from findings in 366 cases who did return for follow-up. Each patient had full eye examination, visual acuity determination, and careful tonometry with Schiotz and applanation tonometers. Normal IOP was 21 mmHg or less. Out of a total of 366 eyes of as many patients, 120 had IOP of 12-16 mmHg and 246 of 17-21 mmHg.

Patients did not receive any preoperative oral medication. All patients used prophylactic antibiotic drops (0.5% chloramphenicol) in both eyes. Pupils were preoperatively dilated, one hour before surgery, with tropicamide 1% and phenylephrine 10% drops.

All our patients had surgery under what we call "local anesthesia plus" in all our patients. "LA+" consists of local infiltration anesthesia combined with injection of equal amounts of pentazocine (Talwin), diazepam (Valium) and haloperidol (Serenace). Surgery was done under an operating microscope. Younger patients had surgery under general anesthesia.

We used a fornix-based conjunctival flap with a 10° to 170° superior ab externo incision at the limbus. Ringer's lactate or balanced salt solution was employed

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for extra- and intra-ocular irrigation in all phases. Following anterior capsulotomy, corneal section was completed with corneal scissors. Nucleus was expressed out, and two or three interrupted sutures of 10-O monofilament nylon were placed at 10, 12, and 2 o'clock positions. The lens material was aspirated with hand held irrigation/aspiration coaxial cannula (McIntyre or Simcoe) using Ringer's lactate or balanced salt solution to which 0.5 ml of cardiac adrenaline had been added for each in 500 ml. A posterior chamber modified J-loop planoconvex lens implant with polypropyline haptics at 10° forward angulation was inserted in eyes which had lens implantation. Methylcellulose 2% solution was used to maintain the anterior chamber. Ocufen eye drops were also tried in first few cases to prevent intraoperative miosis, but as it failed to give desired effect its use was discontinued.

The lens implant was positioned with a dialer. Papillary miosis was achieved either with a drop of 4% pilocarpine solution, or with intracamaral 0.04% carbachol (Miostat). Viscoelastic material was aspirated at the conclusion of procedure. All patients had a peripheral iridectomy. The cataract incision was closed with six or seven interrupted 10-O monofilament nylon sutures, the knots of which were buried on the corneal side.

For intracapsular cataract extraction, cryoextraction was the method of choice. A peripheral iridectomy was also made in all of these cases, and the wound was closed with 8-O virgin silk.

At the conclusion of surgery every cases received gentamicin 20 mg, Decadron (dexamethasone sodium phosphate) 1 mg subconjunctival injections into the inferior fornix. The eyes with lens implants received an additional subconjunctival injection of 20 mg of Depo-Medrol (methylprednisolone acetate) at the conclusion of operation. Postoperatively, patients received four-hourly steroid-antibiotic combination (Maxitrol) drops and 8-hourly 1% tropicamide drops.

Patients remained in hospital for three to five days after operation and were daily examined by slit lamp for any sign of inflammation, pupillary block or lens material left in the anterior chamber. Applanation tonometry was done in suspected cases on the second postoperative day. Follow-ups were scheduled at two, four, six and eight weeks. Each patient had applanation tonometry, slit lamp examination, and ophthalmoscopy at the time of a follow-up visit.

Results

Postoperative intraocular pressure in the first two weeks was 14-16 mmHg in 160 aphakic eyes, 17-21 in 73 eyes, 22-30 mmHg in 14 eyes, and over 30 mmHg in seven eyes. In eyes with intraocular lens implant, the postoperative IOP was 14-16 mmHg in 30 eyes, 17-21 mmHg in 31 eyes, 22-30 mmHg in 16 eyes, and over 30 mmHg in six eyes.

Lens matter was present in 16 eyes with abnormally high IOP, and 21 other eyes developed acute postoperative anterior uveitis. Two pseudophakic and one aphakic patient had pupillary block. Neodymium:yttrium, aluminum, garnet (Nd:YAG) laser iridectomy was required in three eyes for relieving postoperative pupillary block. In two of these eyes, pupillary block was relieved and intraocular pressure controlled, but in third eye the procedure failed and the patient underwent trabeculectomy to relieve glaucoma. Unfortunately, one of our female patients with uncontrolled diabetes developed rubeosis iridis and recurrent hyphema, leading subsequently to thrombotic glaucoma. She was admitted twice to hospital, but as a result of repeated hyphema and vitreous hemorrhages, she lost her vision. Three eyes had argon laser trabeculoplasty; however, two of these also ended up having trabeculectomy to control intraocular pressure.

Comments

The complex mechanism of postoperative elevation of intraocular pressure is related to many factors including: (1) inflammation, (2) release of substances like prostaglandins, (3) deformation of trabecular area reducing aqueous outflow, (4) trabecular obstruction from lens matter, blood clots, pigment, viscoelastic substances, etc., and (5) watertight wound limiting the "safety valve" leak of aqueous humor.[4] In intracapsular surgery alpha-chymotrypsin has been known to cause early postoperative glaucoma,[5] but we did not employ it in our cases. None of our intracapsular cases developed postoperative IOP elevation.

An awareness of this complication of cataract surgery and its prompt recognition are very important. Although in most cases the intraocular pressure soon stabilizes to its preoperative normal, in many susceptible eyes it may lead to permanent visual loss. We can avoid this complication in some of the patients by premedication with oral acetazolamide (Diamox) and topical β–blockers and a meticulous execution of surgical steps.

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Figure 1

Angle-closure Glaucoma Secondary to Multiple Ciliary Body Cysts

ABSTRACT: A 61-year-old woman suffered from recurrent self-limiting attacks of acute glaucoma due to angle-closure caused by the primary epithelial cysts of ciliary body that were present through its entire circumference. Peripheral or sector iridectomy has been reported to be a successful management of this rare type of glaucoma. However, because this patient also had a cataract, I performed cataract extraction with a sector iridectomy and a posterior chamber intraocular lens implant, resulting in the gratifying recovery of sight (from visual acuity of 20/200 to 20/40) and a proper control of glaucoma. (Pakistan Journal of Ophthalmology 8:30, 45, April, 1992.) ☆ Reprint requests to Khalid J. Awan, FPAMS, 1921 Park Avenue, SW, Norton, VA 24273 USA. Fax: (703) 679-5736.

Figure 1, a goniophotograph, is showing multiple translucent epithelial cysts of the ciliary body in one sector of the circumference. The recurrent elevations of intraocular pressure due to angle-closure had fortunately been self-limiting upto the time of patient's first visit. This goniophotograph was taken during a mydriatic test, which proved positive for angle-closure glaucoma. The suspicion that there was some space-occupying lesion pushing the iris away from the lens and closer to the angle structures was also aroused by the unusually wide space between the iris and the crystalline lens on slit lamp examination. The lens had cataractous changes, including anterior subcapsular changes probably caused by pressure from the growing cysts.

Comments

Epithelial cysts of the iris and ciliary body though not common, they have been topic of numerous reports in the past, and in one detailed report they also received attention as probable cause of angle-closure glaucoma.[1] The epithelial cysts of iris and ciliary body may be primary, which can be congenital or acquired, and secondary, which occur following trauma, surgery, or the use of drugs, such as miotics.[2] Here we are dealing with the peripheral (iridociliary) primary epithelial cysts. Clinically, these cysts mostly appear on ciliary processes and the posterior surface of the peripheral iris. They may occur as single or multiple cysts, and Chandler and Braconier[1] reported an eye in which there was " a continuous row of cysts all the way around, each one touching , or almost touching, the next," a situation exactly like that of the patient discussed herein.

The iridociliary cysts are important in that they may be confused with malignant melanoma of the ciliary body, and there have appeared in the past reports of enucleation of such eyes because of a mistaken diagnosis of malignant melanoma.[1] The other less known aspect is their leading to angle-closure glaucoma by pushing the iris against the filtration angle.[1] In one report the spontaneous rupture of a secondary iris cyst caused acute glaucoma, presumably due to "an intense, inflammatory reaction to the contents of the ruptured cyst."[3] The rupture of primary cysts does not lead to such sequelae.[4]

The diagnosis of iridociliary cysts is best made by gonioscopy through a dilated pupil. However, on slit lamp examination one may see a forward peripheral bulging in the iris in the area of a cyst, and in the case of multiple cysts the posterior chamber may appear deeper than usual. Transillumination and ultrasonography will help differentiate these cysts from a malignant melanoma.

Treatment of angle-closure glaucoma secondary to iridociliary cysts that push the iris forward may be medical, by use of miotics, or surgical, if a lasting cure is the aim. Acute angle-closure may respond to a simple peripheral surgical or laser iridectomy; however, when the cysts exist in large number or throughout the circumference, a broad basal sector iridectomy is necessary. Photocystotomy of all cysts is another option,[4] but it may require repitition.

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Figure 2

Spontaneous Corneal Perforation in Rheumatoid Arthritis

ABSTRACT: A 67-year-old woman with advanced rheumatoid arthritis and dry eye syndrome developed mid-peripheral inferior corneal thinning with ulceration in both eyes about two weeks after beginning the use of antibiotic-steroid combination drops prescribed for episcleritis in the left eye and filamentary keratitis in the right eye. A few days later, there occurred a spontaneous perforation of the right cornea. These complications developed despite regular and frequent use of tear substitute drops for nearly three years. The corneal perforation responded well to penetrating keratoplasty. A prophylactic tarsorrhaphy prevented perforation in the other eye. (Pakistan Journal of Ophthalmology 8:31,46, April, 1992.)

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Figure 2 shows a perforation of the left cornea. The peaking of pupil toward the suspected area of cornea confirms this perforation, which is plugged by the prolapsed iris. The patient had no discomfort, and her only complaint was that her vision had diminished in the left eye. The visual acuity in the left eye had dropped from 20/40 (6/12) to 20/200 (6/60). Despite a similar but non-perforated lesion in the right eye, the vision had remained unaffected in it. It is interersting that this patient had been regularly on very frequent tear-substitute drops during daytime and ointment at night for years before these complications developed.

Comments

In 1952, Collier[1] first drew attention to sterile corneal ulceration in patients with rheumatoid arthritis. Non-infectious ulceration of cornea may also occur in patients with other disorders, such as periarteritis nodosa, Wegener's granuloma, cutaneous porphyria, acute leukemia, etc., but is most common in patients with rheumatoid arthritis.[2] Local disorders, such as Mooren's ulcer may be confused with this type of ulceration. I reported craterlike ulceration of the cornea in mycosis fungoides[3] and relapsing polychondritis.[4] Usually, cultures taken from the craters of these ulcers are negative for bacteria, fungi, or viruses. The involvement may be unilateral or bilateral, and there is no change in the corneal sensitivity.

Two most significant predisposing factors for such ulcerations of the cornea appear to be the dry eye syndrome and the use of corticosteroids. Hence, out of a total of 18 eyes with non-inflammatory corneal ulceration reported by Pfister and Murphy,[2] 12 had an abnormal Schirmer 1 test (strip kept over a period of five minutes in the unanesthetized eye) and nine had used topical steroids. Seven of these 18 eyes went on to perforation. Krachmer and Laibson[5] consider the use of topical corticosteroids strongly contraindicated in patients with such corneal ulceration. It is also noteworthy that corneal perforation may develop postoperatively following excision of a pterygium or extraction of a cataract. It is, therefore, possible that trauma also plays some role in the appearance of this type of corneal ulceration in predisposed patients.

Many therapeutic approaches that have been proposed for this kind of corneal ulceration include the use of systemic or subconjunctival heparin, soft contact lens, tissue adhesives, corneal patch graft, conjunctival flap, tear substitutes, penetrating keratoplasty, etc. Currently popular are the use of soft contact lens for ulceration and penetrating keratoplasty for a descemetocele or a perforation.[1] Adhesives, such as isobutylcyanoacrylate, may be employed to patch the small perforations. For a satisfactory result, it is important that the adhesive patch is carefully applied by a plastic disc. The successful use of soft contact lens also requires observation of some rules. The lens should be of greater rigidity, higher water content, and minimal tendency for edge rolling or dislocation. Also punctal occlusion and use of tear substitutes, such as povidonehydroxymethylcellulose, on hourly basis while awake is essential. A preservative-free antibiotic should be topically used prophylactically. Once the acute episode is over, only daytime wear of the contact lens may be tried; however, in some cases it may become necessary to use the contact lens indefinitely.

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Book Reviews

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

REFRACTIVE KERATOTOMY FOR MYOPIA AND ASTIGMATISM, by George O. Waring III, 1992. Mosby Year Book, Inc., 11830 Westline Industrial Drive, St. Louis, Missouri 63146. Hardcover, full-sized 1,369 pages, 1,650 illustrations with 56 four-color plates, 13-page table of contents, 26-page index. Price US$ 225.00.

This true tome is the most voluminous and grandest monograph this reviewer has ever set his eyes on. From the eye-catching royal purple binding with its cover and spine bearing the illustrations of computer-generated finite element models of radial and transverse keratotomy to the superb printing of text and figures on heavy, superior quality paper, this book is an elegant example of state of the art modern publishing. And anyone who has ever attended a lecture by Dr. Waring or known his enthusiasm for teaching would be willing to readily assert that the contents couldn't be any lesser in substance or in clarity of presentation. Yet, one cannot help wondering about the amount of energy and effort this herculean task must have demanded from the author. But then, as the author says, "Mountain climbers are my heroes."

At the conclusion of this review, which admittedly required somewhat longer than usual to complete, the faith of this reviewer was reaffirmed in the author's ability and well-deserved reputation as a teacher and writer. That the author's ever-smiling exterior has a fair and generous inside to it is also confirmed by the fact that he has shown not the slightest stinginess in acknowledging the contributions of others. Hence, one would be pleased to see concise biographic sketches with photographs of other contributors, of which there are 33; even his fellow-investigators of the Prospective Evaluation of Radial Keratotomy (PERK) Study receive recognition with their photographs.

The contents of the book are divided into seven sections of Myopia, Development of Refractive Keratotomy, Patient Selection and Planning for Refractive Keratotomy, Surgery, Results, Corneal Biomechanics and Computer Modeling of Refractive Keratotomy, and Keratotomy for Astigmatism. Each Section is further subdivided into chapters, of which there are 34, with two appendices, one on "Design and Surgical Technique used in PERK Study" and the other titled "Statement on Radial Keratotomy."

It appears logical to give here the titles of all the chapters in this book to present its true scope. Section 1 has chapters on Myopia: A Brief Overview, Corneal Anatomy and Physiology as Applied to Refractive Keratotomy, Optics and Topography of Radial Keratotomy. In Section II, chapters are Development and Classification of Refractive Surgical Procedures, Development of Refractive Keratotomy in the Nineteenth Century, Developments of Radial Keratotomy in Japan, 1939-1960, Development of Refractive Keratotomy in the (late) Soviet Union, 1960-1990, Development of Refractive Keratotomy in the United States, 1978-1990, and Radial Keratotomy on Trial: New Surgical Procedures and Antitrust Laws. Section III, which deals with the patient, legal aspects and expected outcomes of keratotomy is divided into chapters on Patient Educational Materials for Refractive Keratotomy; Refractive Keratotomy, the Law of Informed Consent, and Medical Malpractice; Examination and Selection of Patients for Refractive Keratotomy; Predictability of Refractive Keratotomy, Computerized Predictability Formulas for Refractive Keratotomy. Section IV deals with actual techniques of surgery and contains chapters on Surgical Instruments Used in Refractive Keratotomy; Centering Corneal Surgical Procedures; Atlas of Surgical Techniques of Radial Keratotomy, Repeated Surgery for Residual Myopia and Hyperopia after Refractive Corneal Surgery; Laser Corneal Surgery. Section V has discussions of important postoperative aspects in chapters Corneal Wound Healing and Its Pharmacologic Modification after Refractive Keratotomy; Results of Refractive Keratotomy; Bilateral Results of Radial Keratotomy; Complications of Refractive Keratotomy; Stability of Refraction after Refractive Keratotomy; The Patient Speaks: Testimonials after Refractive Keratotomy; Summary of Factors That Affect the Outcome of Refractive Keratotomy. Chapters on biomechanics and computer applications which make up Section VI include Biomechanics: A Primer for Corneal Surgeons; A Finite Element Model of Radial Keratotomy Surgery, Preliminary Computer Simulation of Radial Keratotomy. The concluding Section VII deals with keratotomy for astigmatism, and is divided into chapters titled Optics and Topography of Corneal Astigmatism; Keratotomy for Astigmatism; Atlas of Astigmatic Keratotomy; Biomechanics of Transverse Incisions of the Cornea; and Computer Simulation of Arcuate Keratotomy for Astigmatism.

Radial keratotomy is no longer an experimental or investigational procedure, and, hence, many ophthalmologists would want to perform it without any restrictions, a privilege that must be earned through proper training. However, to maintain a required degree of skill and an ability to make right decisions, these surgeons must keep up with current information on the basics, the advances in techniques, and the advantages and drawbacks of the procedure as they become apparent through collective experience. Waring's *Refractive Keratotomy* is undoubtedly a peerless source one can depend on for this purpose.

Throughout, the book is like a treasure of quality material on all aspects of keratotomy, but some of the chapters are genuinely superlative. Chapter 12 on examination and patient selection, Chapter 18 on repeated surgery, Chapter 19 on laser corneal surgery, Chapter 20 on corneal wound healing and its pharmacologic modification, Chapter 23 on complications of refractive keratotomy, and Chapter 25 on postoperative views of patients are so saturated with information and practical wisdom that they should become required reading for all ophthalmologists and trainees, irrespective of their level of interest in refractive keratotomy. Similarly, Chapters 17 and 32, which give an extensively illustrated account of surgical steps of the precedure can by themselves serve as one of the top atlases in the field. Chapters 6, 7, and 8 on history of refractive keratotomy, in Japan (including a 3-page stimulating biography of Professor Tutomu Sato by Koichiro Akiyama), in the former Soviet Union, and in the United States are extremely well-written. The last one also contains an absorbing account of the author's visit to Moscow, which reads like a chapter from a fast-moving spy novel. Contents and lucidity are not the only merits of writing, which is teeming with pertinent references from past and present literature. Each chapter concludes with the author's concise comments on the future problems and possibilities of its topic under "Unfinished business."

One could go on and on in praise of this book, but the limitations of allotted space force this reviewer to pronounce his exit line: "If keratorefractive surgery is your cup of tea, the choicest tea bag on market is Waring's *Refractive Keratotomy*." -KJA

ATLAS OF ORBITAL SURGERY, by Charles R. Leone, Jr., Arthur S. Grove, Jr., William C. Lloyd III, Ted H. Wojno, 1992. W. B. Saunders Company, Harcourt Brace Jovanovich, Inc., The Curtis Center, Independence Square West, Philadelphia, Pennsylvania 19106. Hardcover, 187 full-sized pages, 7-page index, profusely illustrated. Price, US $70.00.

One of the things this reviewer liked about this book is the authors' clear-cut concept of its scope. Their aim was "to provide the reader with a concise, accurate, and helpful, guide" for orbital surgery by "concentrating on clear, step-by-step instructions with parallel illustartions featuring the most commonly performed orbital surgical procedures," without dabbling in the diagnostic dilemmas. They deserve congratulations, and our gratitude, for so successfully achieving their goal. *Atlas of Orbital Surgery* is a commendable accomplishment.

The book is divided into five sections. Section 1 deals with anatomical and presurgical considerations, Section 2 describes principles and different approaches of orbital surgery, the entire Section 3 is devoted to surgery of Graves' ophthalmopathy, Section 4 contains discussion of orbital trauma management, and Section 5 contains chapters on surgical treatment of different pathologic entities. One is also pleasantly surprised to find step-by-step descriptions of the surgery of lid retraction, temporal artery biopsy, handling of specimens, fine-needle aspiration biopsy, and a special 5-page write-up on orbital surgery in children.

The quality of writing and the clarity of Mark Weakly's illustrative material are such that *Atlas* will equally prove highly valuable to experts in orbitology, ophthalmic subspecialists, general ophthalmologists, and eye residents. If employed as a companion to Shields' *Diagnosis and Management of Orbital Tumors*, or Rootman's *Diseases of the Orbit: A Multidisciplinary Approach*, this book can make any ophthalmologist almost free of being dependent on any other source on orbital procedures. -KJA

ANESTHESIA FOR OPHTHALMIC AND OTOLARYNGOLOGIC SURGERY, by Kathryn McGoldrick, 1992. W. B. Saunders Company, Harcourt Brace Jovanovich, Inc., The Curtis Center, Independence Square West, Philadelphia, Pennsylvania 19106. Hardcover, 318 pages, 16-page index, 95 black and white illustrations. Price, US $50.00

The greatest asset of this book is that it carries the reader into the domains of anesthesiology, ophthalmology, and otolaryngology deep enough as to sufficiently enlighten him about the plans and priorities of each in a collaborative venture. This text, a reference book and not an anesthesia "how to" cookbook, is a meritable fruition of efforts of 11 experienced anesthesiologists according to Dr. McGoldrick's guidelines. And though chiefly intended for anesthesiologists and anesthetists, the book is not without value for the ophthalmologist.

The first 12 chapters contain discussions of matters otolaryngologic, and the remaining ten chapters deal with ophthalmic anesthesia. The overall scope and usefulness of this well-written book are obvious from its having separate chapters on anesthetics and intraocular pressure, pediatric ophthalmic anesthesia, anesthetic ramifications of ophthalmic drugs, etc. -KJA

ANESTHESIA FOR AMBULATORY SURGERY, edited by Bernard V. Wetchler. J. B. Lippincott Company, East Washington Square, Philadelphia, Pennsylvania 19105. Hardcover, 476 pages, 24-page index. Price, US $58.75

This very readable book offers more than anesthetic considerations; it also defines ambulatory surgery, gives its scope, future, legal implications, and marketing, and even furnishes detailed guidelines on how to set up a successful facility for it. Other than the editor, 17 experts have contributed to 10 very interesting chapters which constitute the entire text. In chapters on complications and special situations, the authors have used the interesting and helpful format of presenting the actual cases and then discussing the related anesthesia aspects.

The book does not give step by step "how to" of actual procedures, such as retrobulbar block, but is full of nuggets of clinical and practical information. -KJA

Abstracts from Elsewhere

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

Ophthalmology
The Journal of the American Academy of Ophthalmology

GLAUCOMA-LIKE DISCS WITH SUBSEQUENT INCREASED OCULAR PRESSURES, B Schwartz, G Tomita, T Takamoto. The authors report four patients with glaucoma-like discs, normal visual fields, and normal ocular pressures (<21 mmHg). These patients were followed without treatment. Increased ocular pressures (>21 mmHg) subsequently developed in these patients at an average of 8.1 years after the recognition of their glaucoma-like discs. Before the increased ocular pressure developed, two patients showed retinal nerve fiber layer loss and one showed optic disc hemorrhages. Of the two possible hypotheses to explain this sequence of events, the first is that the optic discs and nerve fiber layer defects were produced by abnormal diurnal elevation of ocular pressures, or the intraocular pressure of less than 21 mmHg may have been abnormal for the optic disc. The second hypothesis is that there are two independent events, one producing abnormalities in the optic disc and nerve fiber layer and a second producing the increased ocular pressure. *(Ophthalmology 1991; 98:41-49) Reprint requests to Bernard Schwartz, MD, PhD, Department of Ophthalmology, Box 450, New England Medical Center Hospitals, 750 Washington St, Boston, MA 02111.*

ASSOCIATION BETWEEN INTRA-OCULAR PRESSURE PEAKS AND PROGRESSION OF VISUAL FIELD LOSS, RC Zeimer, JT Wilensky, DK Gieser, MAG Viana. The authors report that little is known about the relation between diurnal variations of intraocular pressure (IOP) and prognosis for glaucomatous visual field damage. They studied the association between apparent progressive loss of visual field and the occurrence of IOP peaks. Pressure peaks were detected by a self-tonometer in the natural environment of patients with glaucoma. The study groups consisted of patients with and without a strong indication of progressive visual field losses, all with IOPs of 22 mm Hg or less obtained in the ophthalmologist's office. The patients apparently undergoing progressive visual field loss were found to have significantly more frequent IOP peaks than patients with stable visual fields. A statistical evaluation indicated that in a population with a 30% prevalence of progressive loss loss of visual field, 75% of the patients with peaks have progressive loss and 75% of those without peaks do not have visual field progression. Intraocular pressure peaks were thus shown to have an association with the apparent progression of vision loss independent of the mean IOP. Home tonometry appeared to be a promising tool for identifying patients at increased risk of developing visual field loss who may require intensified follow-up and an alteration in clinical management. However, the present study must be complemented by a prospective study. *(Ophthalmology 1991; 98:64-69) Reprint requests to Ran C. Zeimer, PhD, Applied Physics Laboratory, UIC Eye Center, University of Illinois at Chicago, 1855 W. Taylor Street, Chicago, IL 60612.*

RELIABILITY OF VISUAL FIELD RESULTS OVER REPEATED TESTING, J Katz, A Sommer, K Witt. The authors tested 51 normal subjects, 337 with ocular hypertension, and 55 with glaucoma with C-30-2 test on the Humphrey Field Analyzer on at least three occasions over a 6-year period. The time between tests was approximately one year. Using the manufacturer's standard for a reliable field (false-positive and false-negative rates, <33%; fixation losses, <20%), no trends in the proportion of reliable fields or the component indices were observed over time. Four percent of normal subjects, 9% of those with ocular hypertension, and 8% of patients with glaucoma were unable to meet the reliability standard every time they were tested. This repeated lack of reliability was due almost exclusively to fixation losses. However, patients with glaucoma were more likely to have repeatedly high false-negative responses than those with ocular hypertension or normal subjects, providing further evidence that false-negative responses are more indicative of glaucoma than of patient reliability. *(Ophthalmology 1991; 98:70-75) Reprint requests to Joanne Katz, MS, Wilmer Institute, Room 120, Johns Hopkins Hospital, 600 N Wolfe St, Baltimore, MD 21205.*

INTERNAL AND TRANSCONJUNCT-IVAL NEODYMIUM: YAG LASER REVISION OF LATE FAILING FILTERS, MA Latina, GA Rankin. The authors treated

seven cases of hypofunctioning trabeculectomies or full-thickness filters with the Q-switched neodymium: YAG (Nd:YAG) laser, delivered either transconjunctivally, gonioscopically, or by a combination approach. In four eyes, internal laser revision was attempted initially. Internal revision was successful in one case, where the sclerotomy had become occluded by a fibrous membrane. The Nd:YAG laser was then focused transconjunctivally onto the episcleral fibrous tissue within the bleb in the three eyes treated unsuccessfully by the internal approach and used as a primary treatment in three additional cases. Transconjunctival laser treatment in three additional cases. Transconjunctival laser treatment was successful in producing an immediate and substantial decrease in intraocular pressure (IOP) (mean IOP reduction of 12 mmHg at 2 hours posttreatment) in all cases. In six of seven cases, there was a persistent reduction of intraocular pressure with an average of 5.7 months of follow-up. Transconjunctival Nd:YAG laser revision of hypofunctioning filters may be effective in restoring filtration in selected cases. *(Ophthalmology 1991; 98:215-221) Reprint requests to Mark A. Latina, MD, Wellman Laboratories of Photomedicine, Massachusetts General Hospital, Boston, MA 02114.*

NOSOCOMIAL ENDOPHTHALMITIS SURVEY. CURRENT INCIDENCE OF INFECTION AFTER INTRAOCULAR SURGERY, HM Kattan, HW Flynn, SC Pflugfelder, C Robertson, RK Forster. The authors reviewed the incidence of hospital-linked postoperative endophthalmitis at the Bascom Palmer Eye Institute between January 1, 1984 and June 30, 1989. In a total of 30,002 intraocular surgical procedures, they detected the following incidence of culture-proven endophthalmitis: (1) extracapsular cataract extraction (ECCE) with or without intraocular lens (IOL) implantation -- 0.072% (17 of 23,625 cases); (2) pars plana vitrectomy -- 0.051% (1 of 1974 cases); (3) penetrating keratoplasty (PKP) -- 0.11% (2 of 1783 cases); (4) secondary IOL -- 0.30% (3 of 988 cases); and (5) glaucoma filtering surgery -- 0.061% (1 of 1632 cases). A statistically significant (P = 0.038, Fisher's exact test, two-tailed) increased incidence of endophthalmitis occurred in diabetic (0.163%, 6 of 3686 cases) compared with nondiabetic (0.055%, 11 of 19939 cases) patients undergoing ECCE with or without IOL implantation. The authors also reviewed the incidence of postoperative endophthalmitis after intracapsular cataract extraction (ICCE) with and without IOL and observed an incidence of 0.093% (7 of 7552) in cases operated on between September 1, 1976 and December 31, 1982. *(Ophthalmology 1991; 98:227-238) Reprint requests to Harry W. Flynn, Jr., MD, Bascom Palmer Eye Institute, P.O. Box 016880, Miami, FL 33101.*

PERIBULBAR ANESTHESIA. EFFECT OF BICARBONATE ON MIXTURES OF LIDOCAINE, BUPIVACAINE, AND HYALURONIDASE WITH OR WITHOUT EPINEPHRINE, K Zahl, A Jordan, J McGroarty, B Sorensen, AW Gotta. The authors state that the pH-adjustment of local anesthetic solutions with sodium bicarbonate may shorten onset time and improve spread of neural blockade. They undertook a prospective, double-masked, randomized study to see if a pH-adjusted mixture of lidocaine, bupivacaine, and hyaluronidase had faster and more complete onset of neural blockade, when used for peribulbar anesthesia. Eighty patients were randomly assigned to four groups and received a peribulbar block with one of four mixtures: group 1 (L) = 2% lidocaine, group 2 (LPH) = 2% lidocaine with 0.06 meq/ml sodium bicarbonate, group 3 (LE) = 2% lidocaine with 1:100,000 epinephrine (commercially prepared), or group 4 (LEPH) - 2% lidocaine with 1:100,000 epinephrine with 0.06 meq/ml sodium bicarbonate. To 5 ml of each of the preceding groups, 5 ml of 0.75% bupivacaine and 150 units of hyaluronidase was added. After each block, extraocular muscle movement was followed in each quadrant until akinesia developed. In the event of incomplete akinesia, blocks were supplemented at 20 minutes. The LPH group had the fastest onset to complete akinesia (7.0 $\pm$ 2.0 minutes, mean $\pm$ SEM) when compared with the onset time of all other groups (group 1 = 11.5 $\pm$ 1.9 minutes, group 4 = 13.1 $\pm$ 1.4 minutes, and group 3 = 16.0 $\pm$ 1.8 minutes, significance greater than 95% by analysis of variance). Furthermore, when compared with group 3 by analysis of variance, group 4 had faster onset time. They conclude that pH-adjustment of solutions with bicarbonate of either lidocaine/bupivacaine/hyaluronidase or commercially prepared lidocaine with epinephrine/bupivacaine/hyaluronidase decreases the onset time of peribulbar anesthesia. *(Ophthalmology 1991; 98:239-242) Reprint requests to Kenneth Zahl, MD, Director of Outpatient Anesthesiology, Roosevelt Hospital, 428 W 59th St, New York, NY 10019.*

AN ANALYSIS OF FLEXIBLE ANTERIOR CHAMBER LENSES WITH SPECIAL REFERENCE TO THE NORMALIZED RATE OF LENS EXPLANTATION, ES Lim, DJ Apple, JC Tsai, RC Morgan, D Wasserman, EI Assia. The authors did a survey of 1204 closed-loop anterior chamber intraocular lenses (AC-IOLs) and 310 open-loop AC-IOLs accessioned between November 1982 and January 1990 was conducted at the Center for Intraocular Lens Research. An analysis of complication rates was done after normalization of data with respect to market share totals. The results establish that an unacceptable complication rate is associated with the closed-loop design when compared with either the tripod or quadripod lens styles. Furthermore, the closed-loop designs, while comprising an estimated 45% of the total number of AC-IOLs estimated to be implanted in

the United States (n=674,000), were responsible for 80% of the AC-IOLs explanted after complications and accessioned at the authors' center. A rethinking of the extreme condemnation of all anterior chamber IOLs that has surfaced in recent years is warranted. This is particularly true with respect to indications for use of sutured posterior chamber (PC) IOLs as well as with regard to possible use of open-loop AC-IOLs in less-industrialized nations. *(Ophthalmology 1991; 98:243-246) Reprint requests to David J. Apple, MD, Department of Ophthalmology, Medical University of South Carolina, 171 Ashley Ave, Charleston, SC 29425.*

STRABISMUS PRESENTING AFTER CATARACT SURGERY, LM Hamed. The authors suggest that strabismus presenting after cataract surgery is etiologically related to a heterogenous group of disorders. Clinical data from 63 patients so affected revealed four broad etiologic categories: 1) pre-existing disorders that preceded the cataract surgery, but were rendered asymptomatic by the occluding cataract (e.g., thyroid eye disease, cranial nerve palsy, myasthenia); 2) disorders precipitated by prolonged occlusion by a cataract (e.g., sensory deviations, decompensation of heterophorias, and central disruption of binocular vision); 3) disorders resulting from surgical trauma to extraocular muscles and orbital soft tissues. Traumatic injury to the inferior rectus muscle secondary to retrobulbar anesthesia injection, a specific subset, is postulated to result from a Volkmann's type schemic contracture, a well-known osseofascial compartment syndrome occurring in peripheral skeletal muscles; 4) Disorders related to resulting aphakia/pseudophakia and associated optical aberrations (e.g.; anisophoria, ocular dominance reversal, and color/brightness disparity). The authors discuss the diagnostic and therapeutic implications of these findings. *(Ophthalmology 1991; 98:247-252) Reprint requests to Latif M. Hamed, MD, University of Florida College of Medicine, Department of Ophthalmology, Box J-284, JHMHC, Gainesville, FL 32610-0284.*

AMINOCAPROIC ACID VERSUS PREDNISONE FOR THE TREATMENT OF TRAUMATIC HYPHEMA. A RANDOMIZED CLINICAL TRIAL, MD Farber, R Fiscella, MF Goldberg. The authors studied 112 patients who sustained hyphema after blunt trauma and who were enrolled in a double-blind randomized clinical trial to determine the relative efficacies of aminocaproic acid (Amicar) and systemic prednisone for reducing the rate of secondary hemorrhage. Fifty-six patients received an oral dosage of 50 mg/kg of aminocaproic acid every 4 hours for 5 days, up to a maximum of 30 g daily, and 56 patients received an oral dosage of 40 mg of prednisone daily (adjusted for weight) in two divided doses. Placebo pills and liquids were given to each patient to mask the treatment schedules. There were no statistically significant differences between the patient populations for any demographic or clinical characteristic (e.g., visual acuity, intraocular pressure [IOP], initial hyphema size) measured in the study. Blacks comprised 53% of the study population, and the mean age of the patients was 23.5 years. Four patients in each of the treatment groups experienced a secondary hemorrhage; the rebleed rate was 7.1% in each group. *(Ophthalmology 1991; 98:279-286) Reprint requests to Marilyn D. Farber, DrPH, Department of Ophthalmology, University of Illinois at Chicago, 1855 W Taylor St, Chicago, IL 60612.*

CLINICAL USE OF ULTRASOUND BIOMICROSCOPY, CJ Pavlin, K Harasiewicz, MD Sherar, FS Foster. The authors have developed a method of obtaining images of cross-sections of the intact anterior globe at microscopic resolution. High-frequency ultrasound transducers (50-100 MHz) have been developed and incorporated into a clinical B-scan device capable of producing images in the living human eye to a depth of approximately 4 mm at an axial and lateral resolution approaching 20 μm. Clinical use of this instrument is no more difficult than conventional immersion ultrasonography. The authors' results in a series of 14 clinical cases have shown that this method can provide information unavailable from any other imaging technique. Anterior segment tumors difficult to define with conventional ultrasound can be measured and the extent of invasion determined. Differentiation of tissue on the basis of internal acoustic characteristics is aided by the very fine backscatter speckle patterns at these frequencies. Pathology behind anterior segment opacities can be imaged in detail and the ability to image angle structures in cross-section allows a new quantitative method of gonioscopy. The ability to define the relationship of the iris, posterior chamber, zonules, ciliary body, and lens is potentially helpful in understanding mechanisms of glaucoma. Ocular structures can be measured with increased accuracy. Clinical ultrasound biomicroscopy (UBM) has shown significant potential as an aid in diagnoses of ocular disease. *(Ophthalmology 1991; 98:287-295) Reprint requests to Charles J. Pavlin, MD, FRCS(Can), Ocular Oncology Clinic, Princess Margaret Hospital, 500 Sherbourne St, Toronto, Ontario, Canada M4X 1K9.*

DIURNAL VARIATION OF INTRAOCULAR PRESSURE OF NORMAL-TENSION GLAUCOMA. INFLUENCE OF SLEEP AND AROUSAL, T Ido, G Tomita, Y Kitazawa. In the opinion of the authors the measurement of diurnal variation of intraocular pressure (IOP) is indispensable for the diagnosis of normal-tension glaucoma (NTG). To determine the diurnal variation of IOP, its measurement has to be made repeatedly for 24 hours, which interferes with patients' sleep at night and may influence the

physiologic IOP variation. The authors studied the IOP variation in 82 NTG suspects, whose IOP was first measured every 2 hours for 24 hours. The following night they were suddenly aroused without any notice and IOP was measured. The diurnal IOP variation of NTG patients was found to be similar to that of the normal population and there was no significant difference in the IOP values at the same time points on the two successive nights. Sleep may have little, if any, influence on diurnal IOP variation in NTG patients. *(Ophthalmology 1991; 98:296-300) Reprint requests to Yoshiaki Kitazawa, MD, Department of Ophthalmology, Gifu University School of Medicine, Gifu-shi, 500, Japan.*

ASTIGMATISM AFTER SMALL INCISION CATARACT SURGERY. A PROSPECTIVE, RANDOMIZED, MULTICENTER COMPARISON OF 4- AND 6.5-MM INCISIONS, RF Steinert, SF Brint, SM White, IH Fine. The authors evaluated induced astigmatism and postoperative wound stability in a randomized prospective study of 130 patients undergoing cataract extraction. After phacoemulsification through a scleral pocket, patients received either a 6.5-mm diameter silicone optic posterior chamber intraocular lens (PC IOL) folded for insertion through a 4-mm small incision or a 6.0-mm diameter polymethymethacrylate (PMMA) optic PC IOL placed through an approximately 6.5-mm conventional incision. Vector analysis calculations of prism diopters (D) of mean postoperative-induced keratometric astigmatism for the small incision versus conventional incision groups were, at day 1, 1.54 D versus 3.07 D ($P<0.0001$); at weeks 1 to 2, 1.00 D versus 2.43 D ($P<0.0001$); at 1 month, 0.98 D versus 1.44 D ($P=0.004$); and at 3 months, 0.82 D versus 1.03 D ($P=0.089$). Subgroup analysis of the suturing technique for the 6.5-mm incision showed that the technique of wound closure, as well as the wound size, influenced the induced astigmatism. For all four surgeons using three methods of suturing the 6.5-mm wound, however, the variability in the amount of induced cylinder was least with the 4.0-mm wound closed with a horizontal mattress suture. Complications in the two groups were comparable. *(Ophthalmology 1991; 98:417-424) Reprint requests to Roger F. Steinert, MD, 50 Staniford St, Boston, MA 02114.*

ANTERIOR CAPSULAR TEARS AND LOOP FIXATION OF POSTERIOR CHAMBER INTRAOCULAR LENSES, D Wasserman, DJ Apple, VE Castaneda, JC Tsai, RC Morgan, EI Assia. The authors analyzed 250 consecutive postmortem eyes containing posterior chamber intraocular lenses (PC IOLs) according to the presence and number of radial anterior capsular tears. Over 90% of cases had been done with the "can opener" technique. A surprisingly high percentage of cases, 86%, had one to five radial tears. Furthermore, our analysis showed that the most consistent and most permanent in-the-bag fixation was achieved when only one tear or less was present in the anterior capsule. Because this study shows that the incidence of radial tears is very high after nuclear expression with "can opener" capsulectomy, it provides a scientific basis supporting the transition toward the continuous circular capsulorhexis technique that is slowly evolving. The latter technique has been shown to minimize the incidence of anterior capsular radial tears. This may ultimately serve to decrease the incidence of PC IOL decentration, an important goal if the use of bimultifocal IOLs and IOLs with small or aspheric optics is to be successful. *(Ophthalmology 1991; 98:425-431) Reprint requests to David J. Apple, MD, Department of Ophthalmology, Medical University of South Carolina, 171 Ashley Ave, Charleston, SC 29425.*

EPIKERATOPLASTY FOR KERATOGLOBUS ASSOCIATED WITH BLUE SCLERA, JA Cameron, JB Cotter, JM Risco, H Alvarez. The authors report that the patients with keratoglobus and blue sclera as part of a generalized connective tissue disorder are at a high risk of developing corneal perforations either spontaneously or after mild trauma. Six patients (6 eyes) between the ages of 2 and 16 years of age (mean, 7.5 years) with keratoglobus, blue sclera, hypermobile joints, and consanguineous parents were treated by epikeratoplasty, using commercially prepared 12.5-mm lenticules. Surgery was performed for tectonic support and/or visual improvement and was successful in five of six patients with a follow-up period of 11 to 27 months (mean, 21 months). One lenticule was removed because the epithelium did not heal. Peripheral interface opacities occurred in three patients. *(Ophthalmology 1991; 98:446-452) Reprint requests to Medical Library, King Khaled Eye Specialist Hospital, P.O. Box 7191, Riyadh 11462, Saudi Arabia.*

TRANSIENT CORNEAL OPACIFICATION INDUCED BY COLD IN RAYNAUD'S DISEASE, JA McWhae, DM Andrews. The authors describe a 48-year-old man who presented with longstanding complaints of transient blurring of vision on exposure to cold temperatures. A review of family history was noteworthy in that two of the patient's four sons and the patient's brother had similar complaints. All affected individuals had Raynaud's disease. Results of ophthalmic evaluation showed transient corneal opacities. Slit-lamp video photography under cold stress demonstrated conjunctival vascular changes consistent with Raynaud's phenomenon. An extensive work-up for systemic disease was otherwise negative. The author believe that the anterior segment changes have not been previously reported in idiopathic

Raynaud's disease. *(Ophthalmology 1991; 98:666-669) Reprint requests to David M. Andrews, MD, Nova Scotia Eye Centre, Halifax Infirmary, 1335 Queen St, Halifax, Nova Scotia, Canada B3J 2H6.*

DEVICE DRUG DELIVERY TO THE EYE. COLLAGEN SHIELDS, IONTOPHORESIS, AND PUMPS, ML Friedberg, U Pleyer, BJ Mondino. The authors discuss the external devices that have been used to enhance drug delivery. They review the role of collagen shields, iontophoresis, and pumps used to deliver ophthalmic medications. Collagen shields have been used to deliver drugs and promote corneal epithelial healing. Presoaked collagen shields deliver many drugs to the eye as well as or better than traditional methods such as frequent topical therapy or subconjunctival injection. The efficacy of drug delivery by collagen shields was demonstrated in animal models of graft rejection and bacterial keratitis. Iontophoresis uses an electrical current to carry an ionized drug across tissue. Transcorneal iontophoresis delivers high concentrations of a drug to the anterior segment of the eye. Transscleral iontophoresis bypasses the lens-iris diaphragm and produces adequate vitreous levels. Pumps deliver fluid to the eye for extended periods of time via a tube with its distal opening in the conjunctival sac, corneal stroma, anterior chamber, or vitreous cavity. Clinical acceptance of the collagen shield for drug delivery to the anterior segment is better than iontophoresis or pumps, probably because the collagen shield is simpler and more convenient to use. *(Ophthalmology 1991; 98:725-732) Reprint requests to Bartly J. Mondino, MD, Jules Stein Eye Institute, UCLA School of Medicine, 200 Stein Plaza, Los Angeles, CA 90024.*

VISUAL AND REFRACTIVE RESULTS OF MULTIFOCAL INTRAOCULAR LENSES, HV Gimbel, DR Sanders, MG Raanan. The authors evaluated and retrospectively compared 149 selected cases of bilateral multifocal intraocular lenses (IOLs) with 131 patients with bilateral monofocal IOLs. Seventy-eight percent of multifocal cases and 74.8% of monofocal cases had uncorrected visual acuity of 20/40 or better. Fifty-four percent of multifocal cases had near uncorrected visions of J1 to J3. Eighteen percent had best-corrected near vision of J4 or worse. Sixty-three percent of multifocal cases versus 4% of monofocal cases needed no spectacle correction. Multifocal cases reported significantly more visual side effects (flare, glare, and halos). The 10% of cases with poor satisfaction (rating vision as fair-to-poor) had significantly (P=0.03) more postoperative astigmatism (1.1 prism diopters [D] versus 0.74 D) compared with satisfied (good-to-excellent) cases. Patients who were dissatisfied reported more need for corrective lenses but not more side effects. A greater decrease in contrast sensitivity at low contrast levels was detected among multifocal cases. Both groups had similar contrast sensitivity at 96% and 50% contrast, but at 11% contrast, multifocal cases averaged a loss of 3.45 Snellen lines (to 20/48.2) compared with 2.65 lines (to 20/36) for monofocal cases. *(Ophthalmology 1991; 98:881-888) Reprint requests to Howard V. Gimbel, MD, Gimbel Eye Centre, Suite 450, 4935 40th Ave NW, Calgary, Alberta, Canada T3A 2N1.*

MANAGEMENT OF DISLOCATED POSTERIOR CHAMBER INTRAOCULAR LENSES, WE Smiddy, HW Flynn. The authors note that the management options for posteriorly dislocated posterior chamber intraocular lenses include observation, removal, exchange, and repositioning. Many microsurgical techniques have been developed for repositioning posterior chamber implants. These include repositioning into the ciliary sulcus without suturing if adequate posterior capsule support remains, iris fixation suturing techniques, and scleral fixation suturing techniques. The indications, timing, and techniques for intervention are reviewed in a series of 32 cases with posteriorly dislocated posterior chamber implants. A final visual acuity of 20/40 or better was achieved in 15 (79%) of 19 IOL repositioned cases, in 6 (75%) of 8 IOL exchanged cases, and in 1 (33%) of 3 IOL removed cases. In two patients observed without surgery, final visual acuity was 20/25 and 20/300, respectively. *(Ophthalmology 1991; 98:889-894) Reprint requests to William E. Smiddy, MD, P.O. Box 016880, Miami, FL 33101.*

VISUAL RESULTS AFTER EARLY SURGICAL TREATMENT OF UNILATERAL CONGENITAL CATARACTS, KP Cheng, DA Hiles, AW Biglan, MC Pettapiece. The authors reviewed the records of 25 consecutive patients who had been operated on for unilateral congenital cataracts at 1 year of age or younger and who had been followed for a period of 5 years or longer. Excluded were patients who demonstrated retinal and optic nerve anomalies. Five eyes achieved 20/40 or better Snellen visual acuity, 5 eyes achieved 20/50 to 20/100 visual acuity, and 15 eyes had 20/200 or less visual acuity. All patients with visual acuity of 20/40 or better had cataract surgery performed before 17 weeks of age, at the critical period, and surgery was scattered within this time frame. For surgery performed between 17 weeks and 1 year of age, the best achieved visual acuity in children with surgically significant unilateral congenital cataracts was between 20/50 and 20/100. There was no correlation between the age at the time of surgery and the attainment of these visual levels in this patient subset. *(Ophthalmology 1991; 98:903-910) Reprint requests to Kenneth P. Cheng, MD, 3518 Fifth Ave, Pittsburgh, PA 15213.*

PERFORATING OCULAR INJURIES CAUSED BY ANESTHESIA PERSONNEL, WS Grizzard, NM Kirk, PR Pavan, MV Antworth, ME Hammer, RL Roseman. The

authors noted that between February 1988 and May 1990 they treated 12 perforating ocular injuries caused by anesthetic injections around the eye. All 12 injections were performed by nonophthalmologists. Eleven were performed by anesthesiologists and one by a certified nurse anesthetist. Five were caused by blunt needles and seven by sharp needles. Two of the eyes had multiple posterior exit wounds. The five eyes that had sharp needles, single perforations (i.e., one entrance wound and one exit wound) were easily managed with cryopexy, laser, or observation. All five of these eyes have a visual acutiy of 20/40 or better. Six vitrectomies were performed on the five patients with single perforations caused by blunt needles; three of these eyes have a visual acuity of counting fingers or worse. The two patients who had multiple posterior exit wounds required a total of four procedures. The visual acuity in these eyes is 20/400 and light perception. Anesthesia personnel should be well trained before attempting ocular anesthesia. The use of blunt needles does not pervent ocular penetration. *(Ophthalmology 1991; 98:1011-1016) Reprint requests to W Sanderson Grizzard, MD, 2655 Swann Ave, Suite 100, Tampa, FL 33609.*

NEEDLE PENETRATION OF THE GLOBE DURING RETROBULBAR AND PERIBULBAR INJECTIONS, A Hay, HW Flynn, JI Hoffman, AH Rivera. The authors reviewed the charts of 23 patients with needle penetration of the globe during retrobulbar or peribulbar injections between January 1980 and May 1990. Possible needle penetration risk factors included high myopia, previous scleral buckling procedures, injection by nonophthalmologists, and poor patient cooperation during the injection. Of the 23 cases of ocular penetration, 16 (70%) were from sharp (22-, 23-, and 25-gauge) needles, and 7 (30%) were from blunt (23- and 25-gauge) needles. Management options depended on the severity of the intraocular injury. Retinal breaks without retinal detachment were treated by laser photocoagulation (four cases) or cryopexy (one case) and were observed in three cases. More advanced complications (retinal detachment and vitreous hemorrhage) were usually treated by pars plana vitrectomy with or without a scleral buckle (12 of 14 cases). The final visual acuity was 20/400 or better in only 2 of the 14 retinal detachment cases. In cases without retinal detachment, the final visual acuity was 20/50 or better in 7 of 9 cases. *(Ophthalmology 1991; 98:1017-1024) Reprint requests to Harry W. Flynn, Jr., MD, Bascom Palmer Eye Institute, P.O. Box 016880 Miami, FL 33136.*

OPTIMAL ASTIGMATISM TO ENHANCE DEPTH OF FOCUS AFTER CATARACT SURGERY, MR Sawusch, DL Guyton. The authors note that a small amount of myopic astigmatism can enhance the depth of focus of the pseudophakic eye, optimally providing at least 20/30 visual acuity for both near and distance fixation. For given spherocylindrical refractive errors and fixation distances, the cross-sectional area of Sturm's conoid at the retina was calculated for a schematic eye. These data were used to determine the optimal astigmatic error needed to obtain maximum depth of focus and least theoretical blur for any given spherical equivalent refractive error. Optimal depth of focus was obtained when the plus cylindrical component equaled negative sphere - 0.25 diopters. The near and distance visual acuities of ten pseudophakic patients with induced refractive errors were highly correlated with this model. Low myopic astigmatism after cataract surgery may represent an alternative to mulitfocal intraocular lenses by providing spectacle independence. *(Ophthalmology 1991; 98:1025-1029) Correspondence to Mark R. Sawusch, MD, Doheny Eye Institute, 1355 San Pablo St, Los Angeles, CA 90033.*

RETROBULBAR HEMORRHAGE, RJ Cionni, RH Osher. The authors stated that retrobulbar hemorrhage associated with retrobulbar anesthesia has been construed as a contraindictation to cataract surgery. Cancellation of the surgery results in disappointment for both the patient and surgeon. A retrosepctive study of 60 eyes was undertaken to evaluate the safety of proceedng with small-incision phacoemulsification surgery after retrobulbar hemorrhage when specific criteria are met. If digital massage achieved a soft globe that was easily retropulsed and the eyelids were loose and easily mobilized, the surgery was performed as scheduled. If the globe remained firm within a tense orbit and proptosis with tight lids was present, surgery was cancelled. Fifty-seven cases with retrobulbar hemorrhage met these criteria and underwent phacoemulsification with implantation of a posterior chamber intraocular lens. The lack of intraoperative and postoperative complications suggests that small-incision cataract surgery can be safely performed when preceded by a limited retrobulbar hemorrhage. *(Ophthalmology 1991; 98:1153-1155) Reprint requests to Robert J. Cionni, MD, Cincinnati Eye Institute, 10494 Montgomery Rd, Cincinnati, OH 45242.*

PROGRESSION OF VISUAL ACUITY AFTER PENETRATING KERATOPLASTY, FW Price, WE Whitson, RG Marks. The authors followed a consecutive series of 721 eyes for visual acuity changes after keratoplasty in four groups: keratoconus, Fuchs' dystrophy, pseudophakic bullous keratopathy with retained intraocular lenses, and aphakic/pseudophakic bullous keratopathy with secondary implants during keratoplasty. Follow-up ranged from 12 to 84 months. Keratoconus eyes showed the quickest recovery of visual acuity: by 12 months, 91% attained a best-corrected vision of 20/40, and the mean lines of visual acuity for the group plateaued thereafter. The other three groups showed continuing improvement in vision through 24 months.

From 3 months through 3 years after keratoplasty, the keratoconus and Fuchs' groups consistently showed better visual acuity levels than either the retained or the secondary implant groups (P<0.0001). Reporting changes in visual acuity over time offers multiple advantages compared with providing best-attained or last-recorded visual acuities after keratoplasty. *(Ophthalmology 1991; 98:1177-1185) Reprint requests to Francis W. Price, Jr., MD, 9002 N Meridian St, Suite 100, Indianapolis, IN 46260.*

RESULTS OF PENETRATING KERATOPLASTY ASSOCIATED WITH SILICONE OIL RETINAL TAMPONADE, SW Noorily, GN Foulks, BW McCuen. The authors conducted a review of 14 patients who underwent corneal transplantation after intravitreal silicone oil tamponade with an average follow-up of 28 months. Mean graft survival was 25 months (range, 2 to 61 months). Frequency of graft failure was 43% (6 of 14) with mean occurrence at 14.5 months (range, 2 to 36 months). Allograft rejections occurred in four patients, two of whom progressed to graft failure. The frequency of graft failure was 25% (2 of 8) when silicone oil was removed at the time of keratoplasty compared with 67% (4 of 6) when silicone oil was retained. *(Ophthalmology 1991; 98:1186-1189) Reprint requests to Gary N. Foulks M.D., Duke University Eye Center, Box 3802, Durham, NC 27710.*

CENTRAL PHOTOREFRACTIVE KERATECTOMY FOR MYOPIA. PARTIALLY SIGHTED AND NORMALLY SIGHTED EYES, MB McDonald, JC Liu, TJ Byrd, M Abdelmegeed, HA Andrade, SD Klyce, R Varnell, CR Munnerlyn, TN Clapham, HE Kaufman. The authors report on 10 partially sighted and 19 normally sighted eyes that underwent excimer laser photorefractive keratectomy for the correction of myopia. Nine of the partially sighted and 17 of the normally sighted eyes had 12 months of follow-up. Epithelial healing was complete in all eyes by day 6. None of the eyes had recurrent erosions, infections, or other medical complications. An increase in corneal haze after surgery was followed by a slow trend toward clearing. Average uncorrected visual acuity in the 7 normally sighted eyes with attempted corrections of 5 diopters (D) or less was 20/40 from month 2 on; the eyes with greater than 5 D attempted corrections had an average of 20/80 - at month 2, which declined to 20/200 - by month 6. Best spectacle-corrected visual acuity was within $\pm$ 1 Snellen line of preoperative values in 14 of the normally sighted eyes, improved 2 or more lines in 2 eyes, and worsened two or more lines in two eyes. Hard contact lens overcorrection restored all of the two-line loss in 1 eye corneal flattening without induced astigmatism. *(Ophthalmology 1991; 98:1327-1337) Reprint requests to Marguerite B. McDonald, MD, LSU Eye Center, 2020 Gravier St, Suite B, New Orleans, LA 70112.*

CHANGES IN CORNEAL TOPOGRAPHY AFTER EXCIMER LASER PHOTOREFRACTIVE KERATECTOMY FOR MYOPIA, SE Wilson, SD Klyce, MB McDonald, JC Liu, HE Kaufman. The authors performed a computer-assisted analysis of corneal topography in 17 normally sighted human eyes during the first year after excimer laser photorefractive keratectomy (PRK) for myopia. Laser ablation of the central cornea produced an optical zone with a smooth power transition to the peripheral cornea. Decentration of the ablation was noted in some eyes (<0.5 mm in 3 eyes, 0.5 to 1.0 mm in 10 eyes, 1 to 1.5 mm in 3 eyes, and 2.1 mm in 1 eye), suggesting that careful alignment of the laser beam is critical. Improved methods to align the ablation within the center of the entrance pupil are needed. In 12 of 17 eyes, the topographic pattern appeared to stabilize between 3 and 7 months after PRK. In the remaining five eyes, central ablation power changed by more than 0.5 diopters (D) between the 6- and 12-month examinations. Regression was more common and more pronounced in eyes with intended corrections more than 5 D, whereas the majority of eyes with intended corrections of 5 D or less showed good correspondence between the final change in central ablation power and the attempted correction. Two eyes had a loss of at least two lines of best spectacle-corrected visual acuity that was attributable to irregular astigmatism, decentration of the ablation, and/or corneal opacification. *(Ophthalmology 1991; 98:1338-1347) Reprint requests to Stephen D. Klyce, PhD, LSU Eye Center, 2020 Gravier St, Suite B, New Orleans, LA 70112.*

THE ROLE OF INCREASED INTRAOCULAR PRESSURE ON UPGAZE IN THE ASSESSMENT OF GRAVES OPHTHALMOPATHY, A Spierer, Z Eisenstein. The authors report that the significance of the increase in intraocular pressure (IOP) on upgaze in the diagnosis of Graves ophthalmopathy and its normal range are controversial. The authors measured the increase in IOP on upgaze in 69 hyperthyroid patients with Graves disease, diagnosed at 1 month to 15 years previously, to assess their clinical, laboratory, and ophthalmic state. Ninety-seven healthy subjects served as controls. The distribution of increase in IOP on upgaze values in 46 patients with noninfiltrative ophthalmopathy (classes 0 to 1) was the same as in the control group. The 23 patients with infiltrative ophthalmopathy (classes 2 to 4) had increased frequency of higher increases in IOP on upgaze values compared with the other two groups. However, because of considreable overlap, increase in IOP on upgaze was not discriminatory between the groups. Increase in IOP on upgaze correlated positively with the severity of exophthalmos. There was no correlation among age, sex, time since diagnosis, thyroid functional state, and

drug therapy. The authors conclude that an increase in IOP on upgaze is a normal finding augmented by Graves infiltrative ophthalmopathy. It has no diagnostic advantage over the simple clinical signs of ophthalmopathy. *(Ophthalmology 1991; 98:1491-1494) Reprint requests to Abraham Spierer, MD, Goldschleger Eye Insitutue, Sheba Medical Center, Tel Hashomer 52621, Israel.*

GRAVES' EXOPHTHALMOS UNRELATED TO EXTRAOCULAR MUSCLE ENLARGEMENT. SUPERIOR RECTUS MUSCLE INFLAMMATION MAY INDUCE VENOUS OBSTRUCTION, HL Hudson, L Levin, SE Feldon. The authors report that exophthalmos is the most commonly measured sign of Graves' ophthalmopathy, whereas enlargement of the extraocular muscles is the principal pathologic abnormality. The purpose of this article is to explore possible etiologies of increased volume of orbital fat and of proptosis in patients with no substantially increased total extraocular muscle volume. Computed tomographic scans of the 13 orbits reviewed in this study had the following characteristics in common: a fine, reticular pattern within the orbital fat, a prominent superior ophthalmic vein, and an enlarged superior rectus muscle. Quantitative analysis revealed that superior rectus muscle volume showed a statistically significant correlation with proptosis, whereas medial, lateral, and inferior rectus muscle volumes did not correlate with proptosis. Based on anatomic considerations, the authors postulate that superior rectus muscle enlargement alone may produce reduced venous outflow from the orbit, thereby expanding the apparent orbital fat volume and producing proptosis. *(Ophthalmology 1991; 98:1495-1499) Reprint requests to Steven E. Feldon, MD, Doheny Eye Institute, 1355 San Pablo St, Los Angeles CA 90033.*

INFERIOR RECTUS MUSCLE CONTRACTURE SYNDROME AFTER RETROBULBAR ANESTHESIA, LM Hamed, A Mancuso. The authors suggest that ipsilateral hypotropia with restricted elevation is an increasingly recognized strabismic entity resulting from injury to the inferior rectus muscle after local retrobulbar anesthesia. Eight patients with this disorder are described. Computed tomography of the orbit in three patients demonstrated isolated segmental enlargement of the retrobulbar portion of the inferior rectus muscle; the findings of magnetic resonance imaging in one patient was most compatible with fibrosis. Four patients underwent strabismus surgery consisting of adjustable recession of the affected inferior rectus muscle; all recovered single binocular vision in the functional fields of gaze postoperatively. Surgical exploration of the ipsilateral inferior rectus muscle demonstrated normal anatomy in the peribulbar portion of the muscle. *(Ophthalmology 1991; 98:1506-1512) Reprint requests to Latif M. Hamed, MD, Department of Ophthalmology, J. Hillis Miller Health Center, Box J-284, Gainesvlle, Fl 32610-0284.*

CHARACTERIZATION OF FUNCTIONAL CHANGES IN MACULAR HOLES AND CYSTS, F Acosta, K Lashkari, X Reynaud, AE Jalkh, F Van De Velde, N Chedid. The authors note that precise characterization of functional loss in small retinal lesions is difficult with conventional techniques. Using the scanning laser ophthalmoscope, the authors evaluated functional changes and fixation behavior in 26 eyes with macular holes and 15 eyes with macular cysts. A dense scotoma was present over all macular holes; 24 had no detectable functional alteration at the margins of the hole, and fixation was above the horizontal meridian in all eyes. Nine eyes with cysts had no detectable functional loss over the cyst. Only two eyes had small areas of dense scotoma within the cyst area, and four had areas of relative scotoma. Fixation was central in all eyes. Characterization of functional changes is helpful in differentiating holes from cysts. Photocoagulation at the margin of the holes may result in further functional damage. *(Ophthalmology 1991; 98:1820-1823) Reprint requests to Alex E. Jalkh, MD, Retina Associates, 100 Charles River Plaza, Boston, MA 02114.*

ELECTRORETINOGRAM INTERPRETATION IN CENTRAL RETINAL VEIN OCCLUSION, ME Breton, DP Montzka, AJ Brucker, GE Quinn. The authors report electroretinogram (ERG) data from the initial clinic visit of 39 patients with central vein occlusion (CRVO). No patient had signs of neovascular complications or had received treatment at the time of the ERG examination. Area under the receiver operating characteristic (ROC) curve was used to compare effectiveness of the 4 ERG parameters (Rmax, Log K, b/a wave ratio, and 30 Hz implicit time) in separating those patients who went on to iris neovascularization from those who did not. Rmax is the maximum saturated b-wave amplitude and Log K is the half saturation constant of the Naka-Rushton curve fit to the intensity response data. Discriminant scores, derived using multiple discriminant analysis, were calculated for the total patient groups, CRVO eye alone, and intereye difference. These scores also were compared with the four individual ERG parameters using ROC analysis. Parameters based on amplitude of ERG response, Rmax, and b/a wave ratio are as effective predictors of neovascular response as those interpreted as indicators of retinal sensitivity, such as 30Hz implicit time or Log K. The authors present evidence that loss of b-wave amplitude is not necessarily associated with irreversible loss of inner retinal function. *(Ophthalmology 1991; 98:1837-1844) Reprint requests to Michael E. Breton, PhD, Scheie Eye Institute, 51 N 39th St, Philadelphia, PA 19104.*

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To you have come signs from your Lord;
Whoever therefore sees,
Does so for himself;
And whoever remains blind,
Does so to his own loss.
-Holy Qur'an 6:105

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