Abstracts

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Photorefractive keratectomy with intraoperative mitomycin-C application

Lee DH, Cluing HS, Jeon YC, **Boo SD,** Yoon YD, Kim JG
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Photorcfraclive kcratcctomy (PRK) has been a valuable retractive surgery technique; however, its popularity decreased as laser in situ keratomileusis (LASEK) was introduce to the refractive surgery field. Laser in situ keratomiIeusis has the advantage of little pain and rapid visual rehabilitation as well as reduced complications associated with corneal haze in high myopia. But it has also many disadvantages such as flap-related complications, dry eye, and ectasia. Recently, surface ablation is being performed as laser-assisted subepithelial keratectomy (LASEK) or advanced surface ablation. The pain is less, but haze is a major limitation of PRK or LASEK for moderate to high myopia. Several studies have been performed in an attempt to reduce or inhibit the formation of corneal haze. Mitomycin-C (MMC) is known to reduce corneal haze after PRK or radial karatotomy. It can also prevent the recurrence of haze alter previous surgical complications. The purpose of the present study was to evaluate the safety and efficacy of the prophylactic use of intraoperative application of MMC during PRK.

This retrospective noncomparative case series included 536 patients (1011 eyes) who had had PRK with intraoperative application of MMC using the Nidek EC-5000 excimer laser. Preoperative and postoperative best spectacle-corrected and uncorrected visual acuities, spherical equivalent (SE) refraction, corneal haze graded by slitlamp biomicroscopy, and endothelial cell density measured by specular microscopy were evaluated.

The mean preoperative SE was -7.82 diopters (D) ± 2.64 (SD); 72% of eyes (732) were more than 6.00 D, and 28% (287) were more than -9.00 D. The mean follow-up was 13 months (range 6 to 27 months). Six months postoperatively, the mean postoperative SE was -0.14 ± 0.62 D; 86% were within ± 0.50 D and 93% were within ± 1.00 D of desired refraction. Eighty-six percent had 20/20 or better visual acuity, and 98% were 20/40 or better. Regression of more than 1.00 D occurred in 78 eyes (7.6%), and it was more common in eyes with a preoperative SE of - 9.00 D or worse (18%). Haze occurred in 32 eyes (3.17%), but in most cases it was limited to grade 1. Grades 2 and 3 haze occurred in 3 eyes and 2 eyes, respectively. The postoperative endothelial cell density measured by specular microscopy did not show a significant difference from preoperative measurements. Delayed epithelial healing was observed in 2 eyes.

Authors concluded with remarks that photorefractive keratectomy with intraoperative application of MMC was a safe procedure that produced excellent visual outcomes with few complications.

Clinical results of the blue-light filtering AcrySof Natural foldable acrylic intraocular lens

Marshall J, Cionni RJ, Davison J, Ernest P, Lehmann R, Maxwell A, Solomon K
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In 2003 the U.S. food and Drug Administration (FDA) approved the use of AcrySof Natural intraocular lens (IOL.) (Alcon Laboratories, Inc.) for the replacement of the human lens to achieve visual correction of aphakia in adult patients. The chemical composition acrylale/methacrylate material of the AcrySof Natural IOL is identical to that of the original AcrySof single-piece IOL previously available but with the addition of a proprietary covalently bound yellow polymerizable chromophore. The concentration of the chromophore in the IOL results in a transmission curve that best resembles that of a 25-year-old natural crystalline lens.

Before FDA approval, the AcrySof Natural IOL underwent extensive clinical testing to evaluate the safety and effectiveness of the IOL when implanted bilaterally in the capsular bag after phacoemulsi-fication. With the addition of the chromophore, the IOL became a yellow-tinted lens; thus, concerns were raised as to how the lens would perform with respect to color perception and contrast sensitivity in patients

receiving the IOL. The AcrySof single-piece IOL, which was also implanted bilateral in the capsular bag after phacoemutlsilication, served as the control group.

The purpose of this study was to verify the safety and effectiveness of the new AcrySof Natural (Alcon Laboratories, Inc.) blue-light filtering intraocular lens (IOL), which was designed to achieve a light-transmission spectrum similar to that of the natural human crystalline lens.

In this prospective randomized patient-masked multicenter study, 150 patients received the AcrySof Natural IOL and 147 patients received the AcrySof single-piece IOL as a control. Patients with bilateral age-related cataracts who were willing and able to wait at least 30 days between cataract procedures and had verified normal preoperative color vision were eligible for the study. Standardized surgery included a 4.0 to 5.0 mm capsulorhexis and phacoemulsification. All lenses were inserted in the capsular bag, with verification of in-the-bag placement of both haptics. In all bilateral implantation cases, the same model IOL was used in each eye. Postoperatively, contrast sensitivity and color perception were measured up to 180 days and up to 1 year (for visual acuity) after implantation.

No statistically significant differences were discovered between the 2 patient groups in visual acuity, contrast sensitivity evaluated under mesopic and photopic conditions, or the number of patients who passed the Farnsworth D-15 color perception test. There were no lens-related adverse events in either group.

Authors concluded with the remarks that the blue-light filtering AcrySof Natural IOL was equivalent to the conventional AcrySof lens in terms of postoperative visual performance. Additional long-term clinical studies should show whether the IOL actually provides the theoretical benefits to retinal health.

Evidence for the use of nutritional supplements and herbal medicines in common eye diseases

West AL, Oren GA, Morol SE
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Complementary and alternative medicine (CAM) is defined as a group of diverse medical and health care systems, practices, and products that presently are not considered to be part of conventional (allopathic) medicine. The National Center for Complementary and Alternative Medicine of the National Institutes of Health (NIH) classifies the CAM therapies into the following categories: alternative medical systems, mind body interventions, biologically based therapies, manipulative and body based methods, and energy therapies.

In the United States, there is increasing scrutiny on monitoring herbal medicines and nutritional supplements, which are not monitored the same way as prescription medicines. They come under the Dietary Supplement and Health Education Act of 1994, which requires the statement, "These products and these statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease. Consult a health care professional before using these or any product during pregnancy or if you have a serious medical condition".

There has been a tremendous growth in the use of biologically-based therapies. These are substances found in nature, such as herbs, foods, vitamins, minerals, and other animal-derived products. Between 1990 to 1997, CAM use increased among the US population from 34% to 42%, with a nearly four-fold rise in herbal remedies. A follow-up study showed that CAM use remained stable through 2002, with an estimated use in approximately 72 million adults in the United States.

Given this epidemiologic information on CAM use and its economic impact on medical care costs, physicians should become more knowledgeable about CAM use among their patients, some of whom do not disclose their use to their physicians. Because of the widespread use, ophthalmologists will be faced with patients who may experience adverse effects either directly or from interactions with prescribed medications. In addition, there may not be evidence for the use of these products. The ocular side-effects from herbal medicines and nutritional supplements have been described recently.

The purpose of this writing is to provide a perspective by reviewing the evidence for the role of nutritional supplements and herbal medicines in the common causes of visual impairment.

Published studies and information found in PubMed, International Bibliographic Information of

Dietary Supplements, and selected websites were reviewed for the role of nutritional and herbal medicines in the treatment of age-related macular degeneration, cataract, diabetic retinopathy, and glaucoma. The studies were evaluated systematically for their study design, study population, benefits, risks, biases, and criteria for the categorization of the level of evidence.

The available evidence does support the use of certain vitamins and minerals in patients with certain forms of age-related macular degeneration. For cataracts, the available evidence does not support these supplements to prevent or treat cataracts in healthy individuals. For diabetic retinopathy and glaucoma, the available evidence does not support the use of these supplements. In the category of herbal medicines, the available evidence does not support the use of herbal medicines for any of these ocular diseases.

Because of the widespread use of nutritional supplements and herbal medicines, ophthalmologists should be aware of their use so that they can inform patients properly when the supplements and herbal medicine are being used for eye disease.

Retinopathy of prematurity: the life of a lifetime disease

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Retinopathy of prematurity was originally designated retrolental fibroplasia (RLF) by Terry, who in 1942 first connected the condition with premature birth. By 1950, RLF had become the largest cause of child blindness in the United States and throughout the technologically developed world.

Terry's designation of RLF was based on the pathologic findings in advanced cases, which suggested to him and to Dr Frederick Verhoeff that the basic pathologic condition involved a proliferation of the embryonic hyaloid system. Owens and Owens examined premature infants from birth and found no abnormality of the hyaloid system and concluded that the condition developed postnatally. As the pathogenesis and clinical course of RLF became better appreciated, the term retinopathy of prematurity was substituted.

The purpose of the review article is to provide information on retrolental fibroplasias (RLF), later known as retinopathy of prematurity.

Review of the literature on the subject and a first person account of what was then RLF by one of the authors (A.P.) who was involved in the earliest days in research regarding RLF.

In 1942, elevated levels of oxygen were thought to play a major role in the development of the disease; at that time, no treatment was available. During the lifetime of this disease, other possible causes have been investigated. These include vitamin E as a prophylaxis against retinopathy of prematurity and the efficacy of light reduction to prevent retinopathy of prematurity. It has been shown that the light reduction does not play a role in reducing the progression of retinopathy of prematurity. Vitamin E studies were inconclusive; some studies show a positive effect and others do not. A major advance occurred with the development of the International Classification of Ophthalmology in 1984, which laid the groundwork for collaborative studies to determine whether cryotherapy of the avascular zone of retina would reduce the incidence of blindness in newborn infants, when compared with control subjects. The study showed that cryotherapy was effective; this was followed by laser photocoagulation when lasers became portable enough to take to the neonatal intensive care unit. At the same time, improved surgical techniques moved from scleral buckling for retinal detachment to vitrectomies (some lens sparing) for more desperate cases that had progressed to stage 4 and stage 5 retinopathy of prematurity. Late changes in adults who were born before any treatment and are now baby boomers ran the gamut from the dragging of the retina in the posterior pole to retinal detachment, cataract, and myopia.

Authors concluded with remarks that retinopathy of prematurity is a lifetime disease for which preventive and better treatment modalities continue to evolve.

Amblyopia: Diagnostic and therapeutic options

Carolyn WU, Hunter DG
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Amblyopia is the leading cause of visual impairment in children, affecting up to 4% of the general population. With early detection and treatment, most

cases of amblyopia are reversible, and the most severe forms of the condition can he prevented.

In recent years, some long-established assumptions about the diagnosis and treatment of amblyopia have been called into question, with implications at the scientific, clinical, economic, and political levels. This perspective provides an overview of the current state of knowledge of amblyopia and highlights recent advances in the diagnosis and treatment of this silent, blinding, but preventable condition.

Increased awareness of amblyopia and better screening techniques are required to identify children who are at risk for amblyopia at a younger age. Randomized, controlled trials have established atropine penalization as a viable alternative to occlusion therapy, have suggested that less treatment may be better tolerated and as effective as more traditionally used dosages, and have found no compelling evidence that treatment is beneficial clinically for older (over age 10) children with amblyopia.

Authors concluded with remarks that early detection and treatment of amblyopia can improve the chances for a successful visual outcome. Considering that the conditions that place a patient at risk for amblyopia can be identified, that amblyopia responds to treatment, and that well-tolerated treatments for the condition are now recognized, it is not unreasonable to imagine that, in the near future, severe amblyopia could be eliminated as a public health problem.

Long-term changes in corneal surface configuration after penetrating keratoplasty

Hayashi K, Hayashi H
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Computer-assisted videokeratography is most useful in the assessment of corneal surface configuration because it provides many advantages over keratometry. Corneal topographic analysis is essential for assessment of corneal configuration before many types of corneal surgery and can substantially show any changes arising from the surgery. Specifically, Fourier series harmonic analysis has been applied recently to videokeratography data and has helped to clarify even minute changes in the corneal configuration attributable to ante-dot segment surgeries including keratoplasty, photore-fractive keratectomy, cataract surgery, pterygium surgery and trabeculectomy.

It is known that the corneal configuration changes with time after penetrating keratoplasty (PK). Knowledge of temporal changes in the configuration of the transplanted cornea is of particular importance in making the decision of when astigmatic keratotomy should be performed, and when compression sutures should be placed. Many previous studies using videokeratography reported the topographic pattern of the transplanted cornea and the effect of suture removal on corneal shape after PK. However, only one study described short-term topographic changes of the graft after PK, and that study involved only eight patients, each of whom had keratoconus.

The purpose of the study described herein was to examine the long-term longitudinal changes in corneal surface configuration after PK. To quantitatively evaluate even minute changes, authors used Fourier analysis of videokeratography data. Additionally, temporal changes in visual acuity were examined and correlated with the corneal surface configuration.

One hundred thirty eyes of 130 consecutive patients who were scheduled for PK using 16 interrupted 10-0 nylon sutures were recruited. Spherical equivalent power, regular astigmatism component, irregular astigmatism (asymmetry and higher-order irregularity) component of the central cornea as determined by Fourier analysis of videokeragraphic data, spectacle corrected visual acuity, and spherical equivalent were examined at 1 week, and at 1, 3, 6, 9, 12, 18, and 24 months after PK.

Spherical equivalent power increased considerably for up to 1 month after PK, but thereafter showed no further appreciable change up to the final follow-up at 24 months. The regular astigmatism component decreased markedly for up to 6 months after PK, while the total irregular astigmatism (sum of the asymmetry and higher-order irregularity) component decreased considerably up to approximately 3 months, and then these showed no further relevant change for up to 24 months. Spectacle-corrected visual acuity also improved markedly until approximately 3 months after PK, after which it was virtually stable. Furthermore, important correlations were found between regular and irregular astigmatism and the spectacle-corrected visual acuity.

Authors concluded that corneal surface configuretion after PK appears to be stable by approximately 6

months after PK, concurrent with postkeratoplasty stabilization of visual acuity

Move Stem Cells From the Mouth to the Eye

Tseng SCG
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When the ocular surface is severely damaged by chemical/thermal burns, Stevens-Johnson syndrome with or without toxic epidermal necrolysis, ocular cicatricial pemphigoid, and other conditions, patients frequently experience annoying photophobia and corneal blindness. Aside from progressive inflammatory and cicatricial complications to the entire ocular surface, a leading cause of corneal blindness is the loss of limbal epithelial stem cells cytologically defined as "limbal stem cell deficiency". During the last 15 years, a number of basic research and clinical studies have helped establish several surgical reconstructive procedures for treating limbal stem cell deficiency. They are limbal conjunctival autograft, limbal conjunctival allograft, keratolimbal allograft, and amniotic membrane transplantation.

The aforementioned surgical procedures also propelled ophthalmology into the burgeoning field of regenerative medicine. These procedures are based on the premise that adult stem cells can perform relentless self-renewal to generate their progeny. For the first time in ophthalmology, these procedures transplant the stem cell-containing limbal epithelium to generate the corneal epithelium. Although limbal conjunctival autografts yield overwhelmingly high success rates, keratolimbal allografts and conjunctival limbal allografts attain a relatively low long-term (3 to 5 years) success rates of approximately 50%. Despite continuous oral administration of cyclosporine A, allograft rejection is the first major obstacle when allogeneic limbal epithelial stem cells are transplanted.

Although adult stem cells hold considerable promise for the treatment of a number of diseases in regenerative medicine, the second major obstacle has been to obtain sufficient numbers of autologous or allogeneic stem cells. On the ocular surface, the prevailing solution to overcome this obstacle relies on ex vivo expansion.

Moving the oral mucosal tissue to the eye has long been practiced in the surgical procedure of mucous membrane transplantation. Experimentally, Gipson and associates transplanted cultured oral mucosal epithelium to the rabbit corneal surface. To treat bilateral total limbal stem cell deficiency without the concern of allograft rejection, Kinoshita and Nakamura cleverly first proposed transplanting ex vivo expanded autologous oral mucosal epithelial progenitor cells to the ocular surface. A cultivation protocol similar to that used for expanding limbal epithelial stem cells was used with the goal of overcoming the last major obstacle, that is, to modulate the plasticity of ex vivo expanded progenitor cells to see if they may adopt the corneal epithelial phenotype in the corneal milieu.