YEAR BOOK®

YEAR BOOK OF OPHTHALMOLOGY® 1991

LAIBSON

1991 The Year Book of OPHTHALMOLOGY®

Wills Eye Hospital Editorial Board

Editor-in-Chief

Peter R. Laibson, M.D.

Associate Editors

Raymond E. Adams, M.D.
James J. Augsburger, M.D.
William E. Benson, M.D.
Elisabeth J. Cohen, M.D.
Ralph C. Eagle, Jr., M.D.
Joseph C. Flanagan, M.D.
Leonard B. Nelson, M.D.
Robert D. Reinecke, M.D.
Robert C. Sergott, M.D.
Richard P. Wilson, M.D.

NOT FOR RESALE

Mosby Year Book

St. Louis Baltimore Boston Chicago London Philadelphia Sydney Toronto

[redacted]

Editor-in-Chief, Year Book Publishing: Nancy Gorham
Sponsoring Editor: Gretchen C. Templeton
Manager, Medical Information Services: Edith M. Podrazik
Senior Medical Information Specialist: Terri Strorigl
Senior Medical Writer: David A. Cramer, M.D.
Assistant Director, Manuscript Services: Frances M. Perveiler
Associate Managing Editor, Year Book Editing Services: Elizabeth Fitch
Production Coordinator: Max F. Perez
Proofroom Manager: Barbara M. Kelly

Mosby-Year Book, Inc.
11830 Westline Industrial Drive
St. Louis, MO 63146

Editorial Office:
Mosby-Year Book, Inc.
200 North LaSalle St.
Chicago, IL 60601

[redacted]

International Standard Serial Number: 0084-392X
International Standard Book Number: 0-8151-5267-1

Journals Represented

Mosby–Year Book subscribes to and surveys nearly 850 U.S. and foreign medical and allied health journals. From these journals, the Editors select the articles to be abstracted. Journals represented in this YEAR BOOK are listed below.

Acta Ophthalmologica
American Journal of Ophthalmology
Archives of Ophthalmology
Australian and New Zealand Journal of Ophthalmology
British Journal of Ophthalmology
British Journal of Radiology
CLAO Journal (Contact Lens Association of Ophthalmologists)
Canadian Journal of Ophthalmology
Cancer
Cornea
Human Pathology
Investigative Ophthalmology and Visual Science
Journal of Cataract and Refractive Surgery
Journal of Clinical Neuro-Ophthalmology
Journal of Pediatric Ophthalmology and Strabismus
Klinische Monatsblatter für Augenheilkunde
Neurology
New England Journal of Medicine
Ophthalmic Surgery
Ophthalmologica
Ophthalmology
Orbit
Refractive and Corneal Surgery
Survey of Ophthalmology

STANDARD ABBREVIATIONS

The following terms are abbreviated in this edition: acquired immunodeficiency syndrome (AIDS), the central nervous system (CNS), cerebrospinal fluid (CSF), computed tomography (CT), electrocardiography (ECG), human immunodeficiency virus (HIV), and magnetic resonance (MR) imaging (MRI).

Table of Contents

The material covered in this volume represents literature reviewed through December 1990.

1 Cataract

Cataract Diagnosis: 1991 Version

RAYMOND E. ADAMS, M.D.
Wills Eye Hospital, Philadelphia, Pennsylvania

"It is not so difficult to diagnose a cortical cataract or a subcapsular cataract in its early stages, but to do so in the case of a nuclear cataract requires more clinical experience," states Toshihoro Mizuno, M.D. (1).

Preoperative authorization for cataract surgery is required by the Health Care Financing Administration. This must include hard data, the diagnosis, and vision statements, whereas soft data, the effect on the patient's mode of living, are deemphasized. On-site medical record inspection has been discussed to document quality assurance of private medical practices, the same approach used for hospitals.

This past year produced a large number of articles on the diagnosis and identification of cataract. Applying these ideas may help to balance the increasing bureaucratic pressures of the 1990s.

Physical Characteristics

Slit-lamp microscopy of the lens reveals several zones of discontinuity. The number varies and increases with age. The same zones can be seen in the anterior and posterior parts of the lens. Two superficial zones appear bright and are present in all normal lenses regardless of age. The first represents the lens capsule. The second is the "zone of disjunction," which may represent the young lens fibers whose width correlates with the speed of growth of the lens. Between the two bright bands the clear space has gained new interest with the work of Brown and Tripathi. This, the "subcapsular clear zone," is thought to contain the lens epithelium and the youngest lens fibers (2).

Two possible indicators of early cataract are delayed growth of the lens and abnormalities of the anterior "subcapsular clear zone" of the lens as observed on slit-lamp microscopy. The mean thicknesses of the lens in patients with early cortical or posterior subcapsular lens changes were significantly less than observed in age-matched controls. Sixty percent of lenses with early cataract of all types had a deficient or absent anterior subcapsular clear zone. Lens thickness and the appearance of the anterior subcapsular clear zone are easy to measure and observe through an undilated pupil (3).

In contrast to the age-related cataract, the patient with early-onset diabetes has an increased anterior subcapsular clear zone. The changes in lens dimensions in diabetics may result from an abnormality in the growth of the lens. The rate of new fiber formation might be increased, with more maturing fibers in the anterior clear zone and more maturing fibers making up the increased bulk of the lens. This may relate to the general agreement that the growth hormone level is raised in diabetes associated with retinopathy, and insulin has a mitogenic effect on the lenticular epithelium. An increased dosage of insulin may induce hypertrophy in the epithelial tissue and thereby increase the thickness of the anterior clear zone (4).

It is well known that water-insoluble protein increases in human lenses with age and coloration in cataracts. Cataractogenesis results from the aggregation and insolubilization of lens protein. It is presumed that senile cataract is caused mainly when crystallins coalesce by disulfide bonds as a result of oxidative changes (5). Calculated as a percentage of dry lens weight, the water-soluble crystallins are minimal compared with the high-molecular-weight, water-insoluble crystallins, which are considered the source of the light-scattering patterns in the nucleus (6).

Laser light was used to measure the sizes and scattered light intensities of lens protein particles. Aggregation of α-crystallin in the transparent part of rat lenses can be detected before a galactose feeding lens opacity develops (7).

Diagnostic Tools

Techniques to quantify lens opacification are numerous. The hallmark has been clinical assessment using visual acuity, objective appraisal by retroillumination, and slit-lamp examination. The following are interesting new developments in this field.

Slit-Lamp Examination

Slit-lamp microscopy remains the clinicians' mainstay in the diagnosis and grading of cataract. In general, slit-lamp photographs are not adequate for reproducibility, especially in long-term studies of drug efficacy or drug safety studies. Quantification of cataracts with the slit lamp are described (8) using a new photopapillometer. This instrument, which is mounted on the accessory shoe of the normal slit-lamp, measures the ability of the ocular media to transfer contrast by determining the ratio of the relative brightness values of two locations on the retina.

Scheimpflug Photography

Scheimpflug rotating slit-lamp photography has become the basic method for documentation of lens transparency changes in clinical and experimental ophthalmology because of its high reproducibility. The technical development of a Scheimpflug camera started 15 years ago at the University of Bonn in Germany. By 1977, Topcon Tokyo Optical Company was producing the Topcon SL-45, which was designed according to the handmade model of the Bonn prototype. Delivery of the first 10 instruments was in 1980. In 1987, Topcon Tokyo manufactured the SL-45B, a new instrument with an increased density standard from 5-step to 10-step for better digital image analysis. Nevertheless, the fact that it is impossible to guarantee the recording conditions over a long time (flash fall-off, pupil size, unavailable film type) led Laser et al. (9) to conclude that standardization of data using the cornea as an external standard was the most suitable method for corrections.

A comparison between digital and analog image analysis of Scheimpflug photographs by Meinel (10) was prompted because the negative carries a great deal of information that is visually not readily detectable, especially when comparing several photographs. The advantages of digital processing include quantified measurement, good reproducibility, and successive evaluation of several image parameters, although at higher costs and limited archive keeping.

Three different cameras that operate according to the Scheimpflug principle are available commercially. The Topcon SL-45 produces very sharp images with no or minimal distortion of the lens image. A disadvantage is that orientation of the lenses of small animals is difficult. A great advantage of the Topcon SL-6E with cataract attachment is that the opacity area and depth can be documented simultaneously with the retroillumination and slit image, respectively; a disadvantage is that the slit beam cannot be rotated and flash power is limited. The Zeiss SLC system permits superimposition of pictures for easy orientation and review of the quality of the image before storage (11). In follow-up studies, reproducibility was dependent on the characteristics of the animal cataract model (12).

A CCD TV camera can be used in analysis of the anterior eye segment. With this device, a Scheimpflug slit image and a retroillumination image can be taken separately. The quality of the images was satisfactory for analysis on an on-line computer. These included multilinear densitometry with planimetry, area densitometry, measurement of anterior chamber depth and thickness of lens layers, determination of chamber angle, positioning of the implanted intraocular lens, and measurements of opaque areas in the retroillumination image (13).

The use of ultraviolet filter photography with the Topcon SL-45 camera allows further insight in experimental cataract research with respect to drug toxicity studies (14).

Retroillumination Photography

A retroillumination photograph displays a whole image of a human eye. This two-dimensional documentation is especially important when evaluating cortical and subcapsular cataractous changes for long-term observation.

Sakamoto et al. (15) compared the retroillumination images of the human crystalline lens with different cameras, including the Neitz CT-R. Images obtained with the conventional photo slit-lamp and fundus cameras are not suitable for image analysis. Retroillumination photography with a conventional fundus camera with additional polarizing filters (to eliminate the corneal light reflex) may be useful for daily clinical routine examination. To classify cataracts, an opaque area should be analyzed quantitatively based on a digitalized computer anterior segment analysis system using infrared light for both observation and photography.

The Zeiss standard photo slit-lamp with a Kawara-Obazawa attachment can take retroillumination photographs that are digitalized using a grid method for quantitative analysis (16). With this method a ratio of cataractous area to total area can be calculated by separating an image of a lens into 25 grids. This can be further subdivided into 93 sectors for a substantial increase in resolution of the area of opacification through a computerized analysis of a circular grid (OPAC) and the Neitz CT-R system (17).

Lens Opacity Meter (LOM) 701

It is not so difficult to diagnose a cortical cataract or a subcapsular cataract in its early stages, but to do so in the case of a nuclear cataract requires more clinical experience. Thus to objectively detect or evaluate small changes in the nuclear zone of the lens, the most useful tool to use is Scheimpflug photography. Another method is by means of the lens opacity meter (1).

The IntraOptics Lens Opacity Meter 701 (LOM) (Interzeag, Switzerland) measures the back scattering of a 1.5-mm beam of 700-nm wavelength directed along the visual axis. The scattered light is detected by a photocell 27 degrees below the incident beam. The instrument provides a quick, reproducible, numerical measurement that corresponds well with slit-lamp grading. The readings vary if the pupil size is less than 4 mm. (18). The best results are obtained for mixed and nuclear cataracts, but no correlation is possible when the lens opacity is outside the central area of the lens (19).

The strong correlation of lens density with age, as measured with the LOM, lends support to the observation that the lens changes dynamically throughout life. The lens increases in girth and light scattering steadily from 10 years of age to the 90s. An interesting finding is that patients who are now pseudophakic have the same degree of light scattering (clarity) as a 10-year-old (20).

Contrast sensitivity testing correlates with the opacity lensmeter; however, the latter is much easier to use and faster than the Vistech contrast sensitivity system, demanding less technician time and patient cooperation. Jones and Kratz found that patients typically requested surgery when the density values began to approach 25 to 30 if the lenticular changes were primarily nuclear (20).

Tuft et al. (21) found the LOM to be of little help in estimation of the contribution made by lens opacity to visual loss on an individual basis. However, after linear regression analysis the LOM provided useful information on the contribution of lens opacities to visual acuity loss in a population with cataract. Thus it may be of value in population studies to record the natural history of lens opacity, the ocular effects of drug therapy, and the therapeutic effect of anticataract drugs (20).

A recent study by Adamsons et al. (22) found that the LOM correlated with clinical lens gradings for nuclear opacity only and showed no correlation with grading for either posterior subcapsular opacities or cortical opacities. Furthermore, there was a large degree of overlap between the severity of the nuclear opacity and the LOM measurement, which indicates poor specificity of this device.

After excluding posterior subcapsular cataracts, the LOM did not find a significant correlation between lens opacity and visual field defect. It was concluded that measurement of lens opacification is of little use in evaluating the impact of early-stage cataract on the visual field (23, 24).

Other Diagnostic Methods

Using high-field nuclear MRI microscopy, it is possible to detect early-stage rabbit galactose cataracts (25).

Clinical Grading of Lens Opacities

Lens Opacities Classification System II (LOCS II)

Using a set of colored slit-lamp and retroillumination transparencies to grade increasing degrees of nuclear, cortical and subcapsular cataracts, the LOCS II system claims very good interobserver reproducibility of clinical gradings. The four nuclear grades relate to the degrees of nuclear opalescence. Nuclear color is graded using a standard; cortical grading is based on four standards, as is posterior subcapsular grading (26–31).

Comparing the subjective LOCS II against an objective background subtraction (BGS) analysis found both systems to have good correlation of cortical and subcapsular cataracts. However, the Neitz retroillumination photographs may be more sensitive to small changes in the lens occurring over short periods of time (32). The Italian-American Cataract Study Group, who independently evaluated the LOCS II, found excellent inter- and intraobserver reproducibility of age-related cataract (33).

Japanese Cooperative Cataract Epidemiology Study Group

The findings of this group were similar to those of others evaluating the LOCS II using standard pictures of cortical and nuclear cataract. Nuclear color was expanded to include four grades of lens coloration to enhance clinical evaluation (34).

Beaver Dam Eye Study

The lens was photographed using a Topcon SL-5D slit-lamp camera and a Neitz CT-R red reflex (retroillumination) camera. Nuclear sclerosis grading compared four standard slit-lamp photographs representing increasing opalescence without regard to nuclear lens color. The retroillumination photographs were examined with a measuring grid for cortical and subcapsular opacity grading. The grading schemes have a high degree of reliability across their respective scales. The method of grading cortical opacities provides a finer scale of estimation of the severity and location of involvement than the LOCS II and Oxford grading schemes (35).

Application

Anatomical Application

The depth of the anterior chamber angle is usually estimated by subjectively using a slit-lamp or slit-lamp gonioscope combination. However, expression of the chamber angle as a concrete value may be helpful in clinical studies. Biometry can be performed by image analysis using a Scheimpflug camera to include measurement of the anterior chamber angle (36).

This use can be further expanded to include the relation of the anterior chamber depth to lens thickness. Results clearly indicate a relatively steady decrease of the depth of the anterior chamber from age 30 years on, with a corresponding increase in lens thickness. The association of hypermetropia, elderly women, and acute angle-closure glaucoma may be anticipated with this photographic technique (37).

Using different filters for Scheimpflug color photographs makes it possible to obtain the best combination for differentiating the absorption and scattering characteristics of the lens. This may increase the sensitivity of cataract detection (38).

Clinical Application

The Neitz CT-R camera was used to record retroillumination photographs of the lenses of subjects who underwent general health checkups, including screening for diabetes. A relationship between radial/vesicular cortical lens opacities and diabetes was suspected after a 75-g glucose tolerance test (39). In another prospective study, lens clarity changes were documented in a diabetic population followed for 24 months with the aid of Scheimpflug lens photography and densitometric analysis (40).

Photographic studies were able to determine the efficacy of an anticataract drug in the treatment of diabetic patients with cataracts. The proteolytic drug Lekosim contributes to restoration of the optic properties when opacities are located subcapsularly and parallel to the lens fibers in the surface cortical regions (41).

Unusual diseases that have associated lens opacities may be documented by the specialized photographic techniques. The distinctive wedge and fleck opacities in the Stickler syndrome is an example (42). Another illustration is the progressive axial crystalline cataract located in the embryonal, fetal, and infantile nucleus, which is characteristic of the uncombable hair syndrome (43).

References

1. Mizuno T, Sasaki K, Sakamoto Y: Evaluation of nuclear opacification using a lens opacity meter. *Ophthalmic Res* 22:36–40, 1990.
2. Fagerholm P, Philipson BT, Lydahl E: Subcapsular zones of discontinuity in the human lens. *Ophthalmic Res* 22:51–55, 1990.
3. Perkins ES: Lens thickness in early cataract. *Br J Ophthalmol* 72:348–353, 1988.
4. Sparrow JM, Bron AJ, Brown NAP, et al: Biometry of the crystalline lens in early-onset diabetes. *Br J Ophthalmol* 74:654–660, 1990.
5. Kamie A: Characterization of water-insoluble proteins in normal and cataractous human lens. *Jpn J Ophthalmol* 34:216–224, 1990.
6. Bours J, Ahrend MHJ, Wegener A, et al: Water-insoluble high-molecular-weight and alpha-crystalline as the source of the Scheimpflug light scattering pattern in the rat lens. *Ophthalmic Res* 22:90–94, 1990.
7. Kaneda M, Majima Y, Hattori H, et al: Changes of lens protein particles during

development and reversal of galactose cataracts. *Ophthalmic Res* 22:95–100, 1990.
8. Robert Y, Hendrickson Ph: Die quantifizierung der katarakt an der spaltlampe. *Klin Monatsbl Augenheilkd* 192:406–407, 1988.
9. Laser H, Berndt W, Leyendecker M, et al: Comparison between Topcon SL-45 and SL-45B with different correction methods for factors influencing Scheimpflug examination. *Ophthalmic Res* 22:9–17, 1990.
10. Meinel UR: Comparison between digital and analog image analysis of Scheimpflug photographs. *Ophthalmic Res* 22:71–73, 1990.
11. Kojima M, Wegener A, Hockwin O: Imaging characteristics of 3 cameras using the Scheimpflug principle. *Ophthalmic Res* 22:29–35, 1990.
12. Wegener A, Laser H, Hockwin O: Reproducibility studies with the Zeiss SCL system and animal cataract models. *Ophthalmic Res* 22:18–23, 1990.
13. Sasaki K, Sakamoto Y, Shibata T, et al: The multi-purpose camera: A new anterior eye segment analysis system. *Ophthalmic Res* 22:3–8, 1990.
14. Wegener A, Laser H, Hockwin O: Ultraviolet filter photography to demonstrate the fluorescence of animal lenses with different cataract models. *Ophthalmic Res* 22:56–61, 1990.
15. Sakamoto Y, Rankov G, Sasaki K: Comparison of retroillumination images of crystalline lenses taken with different camera types. *Ophthalmic Res* 22:41–45, 1990.
16. Miyauchi A, Mukai S, Sakamoto Y: A new analysis method for cataractous images taken by retroillumination photography. *Ophthalmic Res* 22:74–77, 1990.
17. Wolfe JK, Chylack LT Jr: Objective measurement of cortical and subcapsular opacification in retroillumination photographs. *Ophthalmic Res* 22:62–67, 1990.
18. Clarke MP, Pearson JCG, Vernon SA, et al: Influence of pupil size on measurements made with the lens opacity meter 701. *Br J Ophthalmol* 74:526–527, 1990.
19. Costagliola C, Iuliano G, Marino E, et al: Quantification and measurement of human lens opacities using the lens opacity meter. *Ophthalmologica* 201:45–48, 1990.
20. Jones R, Kratz R: In vivo lens density measurements using the IntraOptics opacity lensmeter. *J Cataract Refract Surg* 16:115–119, 1990.
21. Tuft SJ, Fitzke FW, Lawerson J, et al: Quantification of lens opacification with a commercially available lensometer. *Br J Ophthalmol* 74:78–81, 1990.
22. Adamsons I, Taylor KI, Enger C, et al: A new method for documenting lens opacities. *Am J Ophthalmol* 111:65–70, 1991.
23. Hoppeler T, Hendrickson Ph, Robert Y, et al: Subject Funktion und PAP/MAK–Verhaltnis bei geringgradiger medientrubung. *Klin Monatsbl Augenheilkd* 192:400–402, 1988.
24. Crichton A, Mikelber F, Douglas GR, et al: Lens opacity as a predictor of visual field impairment due to cataract. *Can J Ophthalmol* 25:287–289, 1990.
25. Ahn CB, Anderson JA, Sung CJ, et al: Nuclear magnetic resonance microscopic ocular imaging for the detection of early stage cataract. *Invest Ophthalmol* 30:1612–1617, 1989.
26. Chylack LT, Lekse MC, Sperduto R, et al: Lens opacities classification system. *Arch Ophthalmol* 106:330–334, 1988.
27. Leske MC, Chylack LT, Sperduto R, et al: Evaluation of a lens opacities classification system. *Arch Ophthalmol* 106:327–329, 1988.
28. Chylack LT, Leske MC, McCarthy D, et al: Lens opacities classification system II (LOCS II). *Arch Ophthalmol* 107:991–997, 1989.
29. Taylor HR, West SK: The clinical grading of lens opacities. *Aust N Z J Ophthalmol* 17:81–86, 1989.
30. West SK, Rosenthal F, Newland HS, et al: Use of photographic techniques to grade nuclear cataracts. *Invest Ophthalmol Vis Sci* 29:73–77, 1988.
31. Datiles MB, Podgor MJ, Sperduto RD, et al: Measurement error in assessing the size of posterior subcapsular cataracts from retroillumination photographs. *Invest Ophthalmol Vis Sci* 30:1848–1854, 1989.

32. Khu P, Kashiwagi T: Subjective (LOCS II) versus objective (BGS) measures of cortical and subcapsular cataracts in retroillumination photographs. *Ophthalmic Res* 22:68–70, 1990.
33. Maraini G, Pasquini P, Tomba MC, et al: An independent evaluation of the lens opacities classification system II (LOCS II). *Ophthalmology* 96:611–619, 1989.
34. Sasaki K, Shibata T, Obazawa H, et al: Classification system for cataracts. *Ophthalmic Res* 22:45–50, 1990.
35. Klein BEK, Klein R, Linton KLP, et al: Assessment of cataracts from photographs from the Beaver Dam eye study. *Ophthalmology* 97:1428–1433, 1990.
36. Shibata T, Sasaki K, Sakamoto Y, et al: Quantitative chamber angle measurements utilizing image-processing techniques. *Ophthalmic Res* 22:81–84, 1990.
37. Olbert D: Relation of the depth of the anterior chamber to the lens thickness: Clinical significance. *Ophthalmic Res* 20:149–153, 1990.
38. Kashiwagi T, Khu PM: New method of measuring nuclear cataract in color Scheimpflug photographs. *Ophthalmic Res* 22:24–28, 1990.
39. Yata K, Fujiwara T, Yamamoto A, et al: Diabetes as risk factor of cataract: Differentiation of retroillumination photography and image analysis. *Ophthalmic Res* 22:78–80, 1990.
40. Dobbs RE, Smith JP, Chen T, et al: Long-term follow-up of lens changes with Scheimpflug photography in diabetics. *Ophthalmology* 94:881–890, 1987.
41. Polunin GS: Influence of certain drugs on the densitometry results of optic lens sections in posterior subcapsular cataracts. *Ophthalmic Res* 22:85–89, 1990.
42. Seery CM, Pruett RC, Liberfarb RM, et al: Distinctive cataract in the Stickler syndrome. *Am J Ophthalmol* 110:143–148, 1990.
43. de Jong PTVM, Bleeker-Wagemakers EM, Vrenson GFJM, et al: Crystalline cataract and uncombable hair. *Ophthalmology* 97:1181–1187, 1990.

Quantification of Lens Opacification With a Commercially Available Lensometer

Tuft SJ, Fitzke FW, Lawrenson J, Silver J, Marshall J (Moorfields Eye Hosp and Inst of Ophthalmology, London)
Br J Ophthalmol 74:78–81, 1990 1–1

The aging human lens absorbs and scatters more light, in part because of aggregatory and postsynthetic changes in the lens proteins. The light scattering is noted subjectively as glare and objectively as reduced visual acuity. The value of a commercially available lens opacity meter, the LM701, in obtaining reliable clinical information on the effect of lens opacity on acuity was investigated. The device measures backward-scattered light from the lens. The series included 102 patients thought to have cataract as the sole cause of lowered visual acuity.

A significant relationship was found between lens opacity meter readings and both Snellen acuity and age. In a given individual the difference in lens opacity readings between the 2 eyes related to the difference in Snellen acuities. Lens opacity readings did not correlate with refractive error, pupil size, or near visual acuity.

Development of cataract is associated with a loss of acuity that is a function of both increased absorption and scatter of light by the lens. Back-scattered light presumably is related to forward scattering of light to the retina, but light scattering is not clearly related to disability as reflected by visual acuity. The lensometer can provide useful data on the contribution of lens opacities to acuity loss in a population with cataract, but it is of little help in estimating the contribution of opacity on an individual basis. The instrument may prove helpful in studying the natural history of lens opacity, the effect of anticataract drugs, and the ocular side effects of various drugs.

In Vivo Lens Density Measurements Using the IntraOptics Opacity Lensmeter

Jones RL, Kratz RP (Univ of California, Irvine; Univ of Southern California, Los Angeles)

J Cataract Refract Surg 16:115–119, 1990 1–2

The IntraOptics opacity lensmeter functions like a slit-lamp, projecting a light source into the eye and focusing rapidly. The IntraOptics opacity lensmeter 701 was used to assess 589 eyes, 21 of which were fitted with polymethyl methacrylate intraocular lenses.

The phakic patients, who had no ocular pathology apart from refractive error or cataract, had an average age of 60 years and an average acuity of 20/30. The average measured lens density was 22.1. Density averaged 9.2 for the pseudophakic subjects, whose mean age was 68.5 years. Neither cortical nor posterior subcapsular cataracts were well recorded with the lensmeter.

The IntraOptics opacity lensmeter is an accurate means of rapidly documenting changes of nuclear cataract. The close correlation of lens density with age supports the view that light scattering increases along with the girth of the lens. Declining contrast sensitivity with advancing age parallels the increase in lens density, and the IntraOptics lensmeter is much easier to use in the clinic than is the Vistech contrast sensitivity system. If lenticular changes are chiefly nuclear, patients characteristically request surgery when density values begin to approach 25 to 30.

▶ How do you estimate nuclear sclerosis (NS)? Do you rate 1 to 4+, or 1 to 5+? What do you call black nuclei of cataracta nigra, 4 or 5+? Before I used the IntraOptics lensmeter, my nuclear sclerotic lens estimates were conservative (1 or 2 + NS had to be light yellow or brown). However, after I used the lensmeter, it was easy to appreciate the 30% reduction in light transmission in 65-year-old eyes and the tremendous increased light transmission with pseudophakos.

I suggest that every ophthalmologist (or optometrist) try to use a lensmeter to compare slit-lamp estimates (use a mydriatic for best instrument readings). Who knows? Maybe the Health Care Financing Administration will require this reading before certifying cataract surgery. It would stop cataract surgery or at least slow things down until everyone mortgaged their homes to pay the $14,000!—R.E. Adams, M.D.

Do Intraocular Lenses With Ultraviolet Absorbing Chromophores Protect Against Macular Oedema?

Clarke MP, Yap M, Weatherill JR (Bradford Royal Infirmary; Bradford Univ, West Yorkshire, England)

Acta Ophthalmol 67:593–596, 1989 1–3

Light in the ultraviolet A (UVA) range is absorbed by the crystalline lens but not by standard polymethyl methacrylate intraocular lenses. Because chronic phototoxicity may be responsible for macular degeneration, a prospective study was undertaken in 55 patients scheduled for extracapsular cataract extraction to test the effect of intraocular lenses (IOLs) containing a UV-absorbing chromophore. Forty-four patients, 23 with UV-filtering lenses, underwent fluorescein angiography.

There was no significant difference in postoperative acuity between patients with and those without a UV-filtering IOL. Fluorescein angiography showed no significant difference in the incidence of cystoid macular edema.

In this study extending up to 2 years postoperatively, incorporation of a UV-absorbing chromophore in the IOL did not lower the rate of macular edema. The chromophores themselves are not known to be biologically inert. Surgeons should attempt to limit exposure of the retina to light from the operating microscope during cataract surgery.

▶ Nearly all IOLs implanted in the United States are labeled as containing a UV blocking agent bonded to the lens material. This is despite the earlier ocular problems caused by UV blocking agents and little evidence in the literature to support the nonanimal use of UV blockers in IOLs.

We use UV blocker IOLs because future proof may be found to support this practice. Clarke and associates found no fluorescein angiography difference to confirm that UV blocking IOLs protect against macular edema. I wonder what the cost of an IOL would be without UV blocking materials? Less than $50?—R.E. Adams, M.D.

Effect of Incision Length, Location, and Shape on Local Corneoscleral Deformation During Cataract Surgery

Armeniades CD, Boriek A, Knolle GE Jr (Rice Univ, Houston; Knolle Ocular Surgery Ctr, Houston)

J Cataract Refract Surg 16:83–87, 1990 1–4

Clinical experience suggests that the use of small incisions in cataract surgery is inherently safer, because the surgeon has better control of the globe during lens removal. The method of finite element analysis was used to examine the effects of incisional parameters on the structural integrity of the globe. Radial deformation of corneoscleral tissue adjacent to the incision was analyzed; the globe was considered to be fixed at the posterior end of its symmetry axis. Incisional lengths of 3 mm and 12

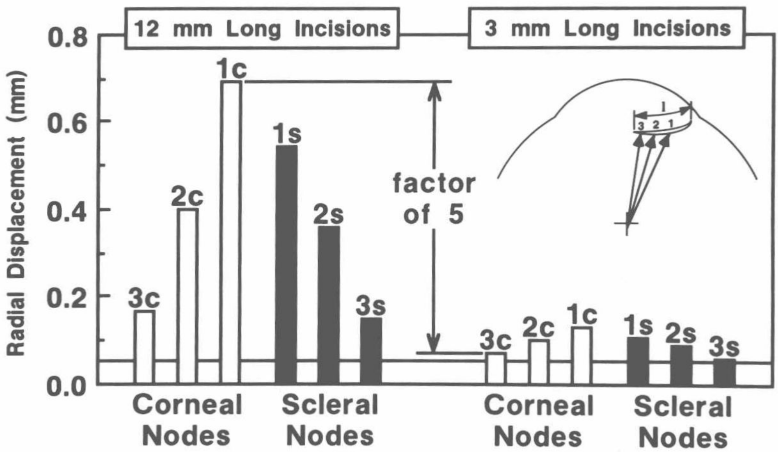

Fig 1–1.—Effect of incision length or radial deformation of corneoscleral tissue: 12 mm vs. 3 mm incisions. (Courtesy of Armeniades CD, et al: *J Cataract Refract Surg* 16:83–87, 1990.)

mm, incisions at the limbus and in the sclera 1.5 mm from the limbus, and stepped and straight-through incisions were compared.

Radial collapse followed the incision because of intraocular pressure lowering. Circumferential strain and longitudinal strain also occurred. Incisional length had the most marked adverse effect; 12-mm incisions caused deformation an order of magnitude greater than distention of the intact globe at 20 mm Hg (Fig 1–1). Scleral pocket incisions 3 mm long produced the least structural disturbance. Changing from a limbal to a scleral incision site had no effect if incision length remained the same. The 3-mm pocket incision deformed local tissue so little that it was difficult to distinguish from corresponding displacement of the intact globe.

A short incision minimizes radial deformation of the adjacent corneoscleral tissue. A 3-mm scleral pocket incision produces the least tissue deformation.

▶ Surgeons recognize that small wounds cause less tissue destruction and less inflammatory response and repair compared with large wounds. Also, large cataract wounds increase the risk because the intraocular pressure gradient is lowered for prolonged periods. Expulsive choroidal hemorrhage, a complication of intraocular surgery, is more frequent with large wounds of penetrating keratoplasty and glaucoma surgery. On the other hand, a small wound has less area to leak or break open, given the same suturing skill and material.

I have noted in cataract surgery a clear-cut decreased inflammatory response in the immediate postoperative period (24 hours to 2 weeks) when using a 4-mm incision and a foldable intraocular lens compared with the 8-mm scleral pocket incision and a 1-piece polymethyl methacrylate lens.—R.E. Adams, M.D.

Complications of Sulcus-Supported Intraocular Lenses With Iris Sutures, Implanted During Penetrating Keratoplasty After Intracapsular Cataract Extraction

Busin M, Brauweiler P, Böker T, Spitznas M (Univ Eye Hosp, Bonn, Germany)
Ophthalmology 97:401–406, 1990 1–5

Various techniques have been introduced in recent years for implanting a posterior chamber intraocular lens (IOL) in the absence of the posterior capsule. The loops of the IOL are placed in the ciliary sulcus. Fixation is achieved by transscleral sutures securing the haptics at the level of the sulcus or by suturing the body of the IOL to the iris.

Results were reviewed in 14 consecutive patients, 7 of whom had aphakic bullous keratopathy and 7, pseudophakic bullous keratopathy. The patients were followed for an average of 7.6 months. Best-corrected postoperative visual acuity was 20/60 or better in 4 patients and 20/200 or better in 8. Four eyes were glaucomatous before surgery. Glaucoma persisted in these cases and developed in 4 others. Goniosynechiae developed postoperatively in 4 eyes. Pseudophakodonesis of various extent was noted in 10 eyes. Cystoid macular edema was diagnosed preoperatively in 1 case. This did not improve after surgery and developed in 3 additional eyes after surgery.

Postoperative visual acuity worse than 20/200 was caused by cystoid macular edema in 3 cases, graft rejection in 1, central retinal scar in 1, and optic nerve atrophy in 1. A distortion of the pupil was observed in 3 eyes in miosis and in 4 additional eyes in mydriasis. Corneal thickness and anterior chamber depth were within normal limits. Fluorophotometric assessment of the blood-aqueous barrier showed values comparable with those after intracapsular cataract extraction and implantation of an iris-fixated IOL.

Although the visual results were relatively good in this series, the high incidence of cystoid macular edema and glaucoma after surgery may discourage the use of this technique in such cases. Intraocular lenses implanted in the posterior chamber at the time of penetrating keratoplasty in the absence of the posterior capsule, their support depending on iris sutures, behave similarly to iris-fixated IOLs implanted after intracapsular cataract series. As an alternative to this technique, surgeons may prefer implanting posterior chamber IOLs with transscleral fixation at the level of the ciliary sulcus or using anterior chamber IOLs of the new generation.

▶ Iris support of an IOL is as questionable today as it was during the iris-plane IOL era. Pseudophakodonesis and distortion of the pupil are common. My experience seems to suggest that suturing the IOL to the ciliary sulcus can be tolerated by the eye. I have noted several fluorescein-documented cystoid macular edema amblyopic eyes in which vision has improved by removal of the anterior chamber IOL and replaced with a sutured ciliary sulcus IOL; in none has glaucoma developed.— R.E. Adams, M.D.